TECHNICAL REPORT
UNDERGROUND TANK INVESTIGATION
NAVAL STATION TREASURE ISLAND
HUNTERS POINT ANNEX, SAN FRANCISCO, CALIFORNIA

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TECHNICAL REPORT

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HUNTERS POINT ANNEX,
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LIST OF ACRONYMS

ASTM - American Society for Testing and Materials
BTX - Benzene, Toluene, and Xylenes
CDMG - California Division of Mines and Geology
CGI - Combustible Gas Indicator
CIH - Certified Industrial Hygienist
CPR - Cardio Pulmonary Recussitation
DA - District Attorney
DCA - Dichloroethane
DCE - Dichloroethene
DHS - Department of Health Services
DOT - Department of Transportation
Energy Systems - Martin Marietta Energy Systems, Inc.
EPA - Environmental Protection Agency
HAS - Health and Safety
HPA - Hunters Point Annex
HPLC - High Performance, Liquid Chromatography
HSO - Health and Safety Officer
IAS - Initial Assessment Study
IDLH - Immediately Dangerous to Life and Health
IT - International Technology Corporation
LEL - Lower Explosive Limit
LUFT - Leaking Underground Fuel Tank
MSDS - Material Safety Data Sheet
MSL - Mean Sea Level
NIOSH - National Institute for Occupational Safety and Health
OSHA - Occupational Safety and Health Administration
ppb - Parts per Billion
ppm - Parts per Million
PCB - Polychlorinated Biphenyls
PEL - Permissible Exposure Limit
QA/QC - Quality Assurance/Quality Control
RWQCB - Regional Water Quality Control Board

LIST OF ACRONYMS
(Continued)

SCBA - Self Contained Breathing Apparatus
SCF - Standard Cubic Foot
SUPSHIP - Supervisor of Shipbuilding, Conversion and Repair
TCA - Trichloroethane
TCE - Trichloroethylene
TIP - Photovac Tip I
TLV - Threshold Limit Value
TPH - Total Petroleum Hydrocarbons
UST - Underground Storage Tank
VOC - Volatile Organic Compounds
WESTDIV - Western Division, Naval Facilities Engineering Command

1.0 INTRODUCTION

1.1 PURPOSE AND OBJECTIVES

This report describes the results of field and laboratory studies undertaken during the leak detection phase (Tasks 3 and 4) of the underground tank investigation at Naval Station Treasure Island, Hunters Point Annex, San Francisco, California. The purpose of this investigation is to locate all underground tanks at Hunters Point Annex (HPA), identify their contents, determine those tanks which are leaking, determine the vertical and horizontal extent of contamination of the soil and in the ground water, prepare specifications for the removal of the underground tanks located on the base, and to provide technical support to WESTDIV during the removal of the tanks.

Specific objectives for Tasks 3 and 4 of the investigation are:

- Identification/confirmation of tank locations and tank contents (Task 3).
- Determination of leaking tanks through the use of soil gas surveys or soil borings (Task 4).
- The summarization of results from this project in this report (Task 4).

Completion of these tasks will be followed by:

- Characterization of sites with tanks found to be leaking, definition of local ground water gradient and determination of the vertical and horizontal extent of contamination in the soil and ground water.
- Preparation of plans and specifications for the removal of leaking tanks.
- Technical support to WESTDIV during removal of the tanks.

IT Corporation is conducting these activities under the direction of Martin Marietta Energy Systems, Inc. (Energy Systems) and a California registered geologist. The plan and methods used for the investigation have been reviewed by the U.S. Navy, Western Division (WESTDIV) Naval Facilities Engineering Command, the organization responsible for the related activities at Naval Station Treasure Island, Hunters Point Annex. All other environmental concerns not directly related to the underground tanks are being addressed separately by the Navy.

1.2 PREVIOUS TASKS COMPLETED FOR PROJECT

Prior to the field and laboratory studies conducted in Tasks 3 and 4, IT completed two other tasks.

An initial coordination meeting and site walk (Task 1) was attended in February, 1988 by representatives of Energy Systems, WESTDIV, and the Naval Station Treasure Island, Hunters Point Annex staff.

Following the initial meeting, IT developed a Project Plan for the Tank Investigation (Task 2) and submitted the plan for review by all concerned regulatory agencies identified. This Project Plan, consisting of four volumes issued in September 1988, provided the procedures and rationale for the investigative methods used in Tasks 3 and 4.

2.0 SITE BACKGROUND

2.1 SITE DESCRIPTION

Naval Station Treasure Island, Hunters Point Annex (HPA) is in southeastern San Francisco at the tip of a peninsula extending eastward into San Francisco Bay (Figure 2-1). The Navy property encompasses a total of 965 acres; of these, 572 acres comprise the on-land facilities, with the remaining area a portion of San Francisco Bay. The facility is bounded on three sides by San Francisco Bay and on the fourth by the Hunters Point district, which consists of both public and private residential housing and commercial/ industrial buildings (Figure 2-2, Appendix E).

The northern and eastern shores of HPA are developed for ship repair and equipped with drydock and berthing facilities. No shipping facilities are present along the southern shore, which consists primarily of emplaced fill.

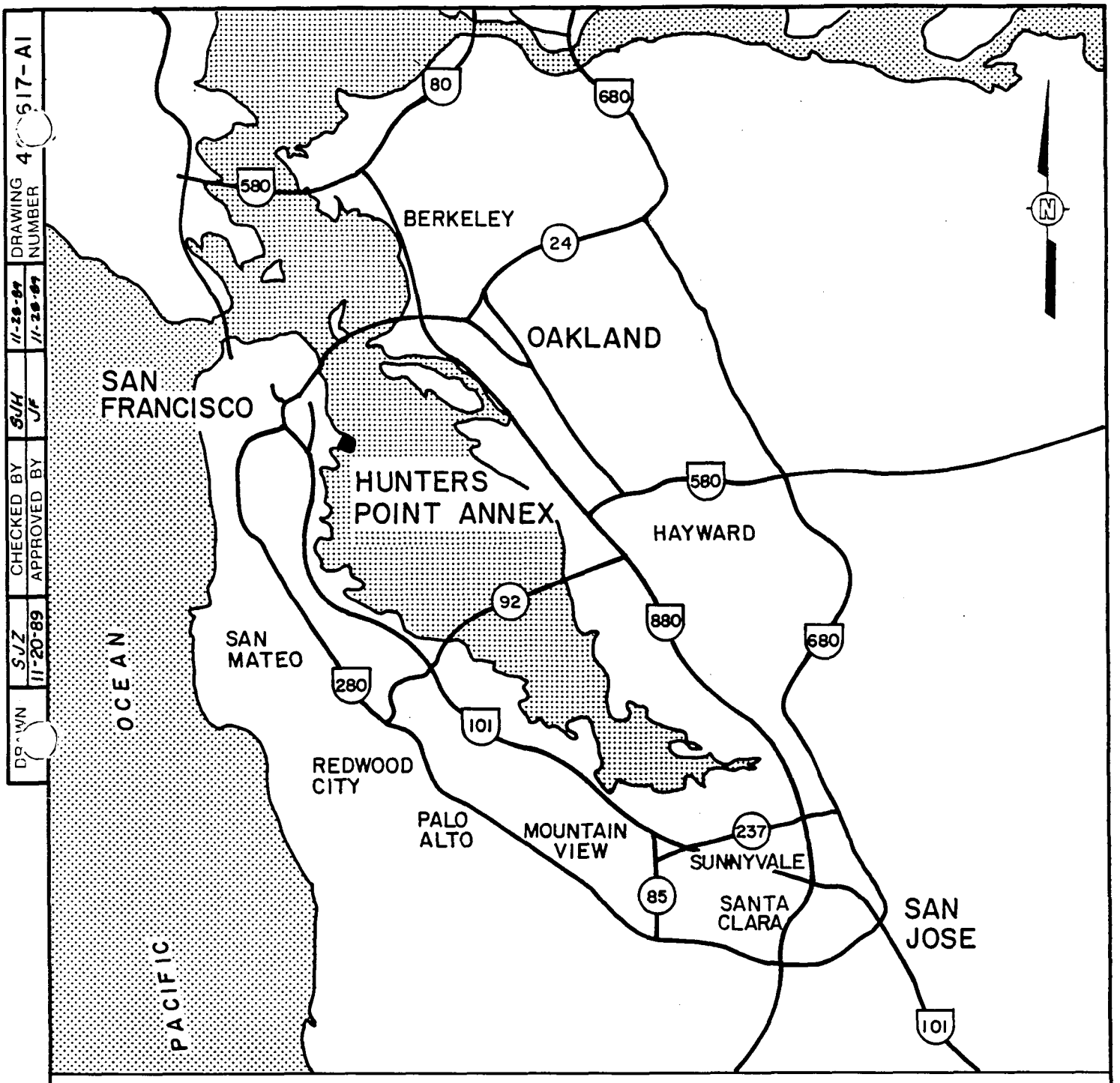
Approximately 70 to 80 percent of the lands within HPA consist of relatively level lowland areas that were constructed by placing fill along the bay margin. The remaining area is a moderately sloping ridge in the northwestern portion of the site. Elevations across the site (in feet above mean sea level, MSL) range from about 6 to 10 feet in the lowlands to about 176 feet on the ridgecrest. Substantial cut and fill grading of the ridge occurred in the past to generate material for filling the lowland areas and to construct building pads.

Surface drainage appears to be primarily unconcentrated sheet-flow runoff that is collected by on-site storm sewer systems and discharged into San Francisco Bay. Extensive grading and construction of HPA has filled or modified any pre-existing drainage channels and no naturally occurring, channelized drainage crosses the facility.

2.2 SUBSURFACE CONDITIONS

2.2.1 Geology

The geologic logs of numerous borings and wells installed at HPA have been used in developing an understanding of the subsurface stratigraphy of the



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CHECKED BY SJH 11-28-89
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FIGURE 2-1

SITE LOCATION MAP

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site. Four geologic units underlie the site. The oldest unit is bedrock of the Franciscan Complex. The Franciscan Complex is overlain in some areas by undifferentiated sedimentary deposits consisting of consolidated sands and clays, which are in turn overlain by estuarine deposits of clay, silt, sand, and peat, termed "bay mud." In several areas, artificial fill has been placed over the bedrock and/or the bay mud.

The Franciscan Complex bedrock is a tectonic assemblage derived from igneous and sedimentary rock that accumulated at the western margin of North America between 50 and 150 million years ago. Franciscan rocks have been extensively deformed and some have also been metamorphosed, during their long geologic history, giving rise to a chaotic assemblage of variably sized blocks of sandstone, greenstone, shale, chert, and serpentinite, which are often bounded by ancient, inactive faults or shear zones. Serpentinite is the dominant bedrock type at HPA and constitutes a block that trends northwest and extends to Fort Point. The potential variability in rock types and structure within the Franciscan Complex can create highly variable geologic and hydrogeologic properties over relatively short distances.

Along the southwest margin of the site, prior studies encountered stiff clays and dense sands overlying bedrock. These units are tentatively correlated with the "Undifferentiated Sedimentary Deposits" of Bonilla (1971) and may be equivalent to the Colma Formation of Quarternary age. Insufficient data are currently available to determine whether this unit is present at depth at other locations of the site.

Within the San Francisco Bay estuary and over much of HPA, the bedrock and undifferentiated sedimentary deposits are blanketed by bay mud. These estuarine deposits accumulated during approximately the last 11,000 years and reach thicknesses of about 50 feet in some portions of HPA (Lowney/Kaldveer, 1972). The bay muds generally consist of soft, saturated plastic silts and clays with interbedded sand and peat. In many areas of the bay, the soft younger bay mud deposits grade into stiff silts and clays termed "older bay mud." While older bay mud deposits may be present in the offshore areas of HPA, insufficient test boring data are available to differentiate the older bay mud from the underlying undifferentiated sedimentary deposits.

Consequently, all of the stiff soils logged beneath the younger bay mud are collectively grouped with the undifferentiated sedimentary deposits.

Development of HPA has involved construction of fills over both bedrock and bay mud. Within the shipyard, fill is estimated to cover about 70 to 80 percent of the area, with bedrock exposed in the central upland area. The fill consists of two general types. The first type, a material derived predominantly from excavation of bedrock to create level areas for shipyard activities, varies in composition from serpentinite and associated ultramafic rocks to mixtures of serpentinite and Franciscan sandstone, chert, greenstone, and shale. The second type is mainly sandblast waste. In the early to mid-1940s, the Navy began placing the wastes along the bay margin, primarily as a means to dispose of these materials.

The site has experienced strong ground shaking as the result of several historical earthquakes. These include the 1906 San Francisco Earthquake on the San Andreas Fault (Richter Magnitude 8.3) and earthquakes in 1836 and 1868, centered on the Hayward Fault (Richter Magnitude 7.0). Strong ground shaking at HPA is likely in the future. However, there are no historical accounts of surface fault rupture within the site, nor are any active faults known to traverse the site (C.D.M.G., 1985).

2.2.2 Hydrogeology

Few data are currently available regarding the local hydrogeology at HPA. Additional information was collected during recently completed Task 4 activities.

Ground water occurs within the unconsolidated fill and alluvial materials and also occurs within the fractured bedrock underlying the site. The depth to water in the unconsolidated materials ranges seasonally from 2 to 12 feet below ground surface. The depth to water within the bedrock was five feet below ground surface in one boring (near Building 813) at the base of the prominent hill on Hunters Point. In general, ground water beneath the site probably flows radially from inland areas of higher elevation toward the bay (Figure 2-2). However, local ground water flow directions may be quite complex due to variations in topography and the hydraulic properties of

subsurface fill materials. In some areas, local flow directions may also vary periodically due to the influence of tidal fluctuations of the bay and localized recharge from storm events.

2.3 SITE HISTORY

Naval Station Treasure Island, Hunters Point Annex (HPA) was operated as a commercial dry dock facility from 1869 until December 29, 1939, when the property was purchased by the Navy. Following the purchase, the facility was leased to the Bethlehem Steel Company who began operating it as a shipyard where naval ships and submarines were modified, maintained, and repaired. In addition, HPA was used for personnel training, limited radiological operations, research and development, and design of ships, and also provided nonindustrial services to Navy personnel and their families.

At the time of a July 1969 survey (WESTEC, 1984), there were 397 buildings used for industrial purposes and 57 buildings used for nonindustrial purposes at HPA. These structures were distributed into three functional areas:

Basic Industrial Production Area - This area was located in the northern and eastern portion of the shipyard and included the waterfront and shop facilities. The waterfront facilities consisted of 24,000 linear feet of pier, quay wall, and wharf space. There were forty 500-foot-long-deepwater berths (21 of which were fully equipped), six dry docks of various sizes, a regunning pier, and a crane support structure.

Industrial Support Area - This area was located in the central and southwestern portion of the shipyard. These facilities included those operations, such as supply and public works, that provided support services to the industrial production activities.

Nonindustrial Area - This area was located in the northwestern and southern portions of the shipyard. The facilities included barracks, officer's quarters, and recreational facilities. Most of the disposal areas are also located in the southern portion.

In late 1975, the Navy's shipyard operations ceased and the property was placed under the control of the Navy's Office of the Supervisor of Shipbuilding, Conversion, and Repair, San Francisco (SUPSHIP-San Francisco).

In May 1976, most of HPA was leased under a five-year lease to Triple A Machine Shop which operated it as a commercial ship repair facility. In addition, portions of the facility were subleased by Triple A to private

warehousing, industrial, and commercial firms. In June 1981, Triple A's lease was extended for a second five-year term. This extension expired in June 1986, at which time the Navy began proceedings to retake possession of the property. Following actions taken by the United States District Attorney, Triple A vacated the facility in mid-1987.

Activities by both the Navy and Triple A were related to ship repair, maintenance, and construction. As a result, similar materials were used by both including paints, solvents, fuels, acids and bases, metals, polychlorinated biphenyls (PCBs), and asbestos. Information on waste generation and disposal by the Navy is presented in the Initial Assessment Study (WESTEC, 1984), which covered the period from 1941 through 1974. Information on the activities of Triple A from 1976 to 1987 has been developed by the San Francisco District Attorney (DA, 1986). No data are currently available regarding activities prior to 1941 (when the Navy took possession of HPA) or activities by Triple A's sublease holders. The history of waste generation and disposal at HPA is described below according to activities performed by the Navy (1941 to 1974) and activities performed by Triple A (1976 to 1987).

2.3.1 Storage Tanks

The Initial Assessment Study (IAS) indicated that between 1942 and 1974, there were approximately 10 above ground and 35 buried storage tanks at HPA. The 10 above ground tanks are not included as part of this investigation. However, those 10 tanks are part of the Installation Restoration Program (IRP) at Hunters Point Annex and are known as the IR-6 site. A list of underground tank numbers, tank type, capacity, location, and contents for this investigation is provided in Tables 3-1 and 3-1A.

According to WESTDIV, 13 underground tanks were removed prior to 1975. Documentation regarding the removal of these 13 USTs is not readily available since regulatory requirements regarding records of removal operations were not as stringent at the time of these removal actions. Only one spill or leak has been confirmed (by the IAS) for either buried or above ground tanks at HPA; in the early 1940s, one of the 12,000-gallon diesel tanks (above ground) ruptured and its contents overflowed the Tank Farm berm area. The spilled oil was apparently cleaned up and placed in the Oil Reclamation Ponds.

3.0 TASK 3 ACTIVITIES AND RESULTS

3.1 PURPOSE AND OBJECTIVES

The purpose of Task 3 of the investigation was to locate the known or suspected underground tanks at HPA, determine the tanks composition and their contents. This data is presented in Table 3-1. This effort was done using the following techniques:

- Review of maps and drawings supplied by HPA
- Interviewing personnel currently or formerly employed at HPA
- Geophysical magnetic survey
- Sampling of tank contents
- Laboratory analysis of contents.

3.2 REVIEW OF MAPS AND INTERVIEWS

A review of the maps and drawings supplied by WESTDIV NAVFACENGCOM (Western Division Naval Facilities Engineering Command) was undertaken prior to completion of the Work Plan. A list of these drawings is included in the references for this report.

Interviews with HPA personnel were conducted at this time and continued during the field investigation. Results of both activities generated a list of sites that were further investigated with geophysical instruments.

3.3 GEOPHYSICAL SURVEYS

Prior to field sampling, and after review of available documents, a geophysical survey was performed around suspected tank locations. Equipment used included both flux-gate and proton-precession magnetometers. The results obtained from this survey are included in Appendix A as the Geophysical Report dated November 1988.

3.3.1 Survey Methods

The geophysical study used magnetometers to delineate subsurface locations and orientations of tanks and pipelines extending from the tanks. At most of the sites, the tank locations could be visually determined from tank manways and shutoff valves associated with each tank. In these instances, the flux-gate magnetometer was used to determine tank orientation and pipes extending from the tank by scanning the area around the tank valves until the tank boundary

was identified. To detect the location and direction of associated subsurface piping, the area around the perimeter of the tank was also scanned using a proton-precession magnetometer which can detect buried metal much deeper than the flux-gate unit.

Where suspected tank locations were unknown, the flux-gate magnetometer was used to trace the vent pipes back to the tank. If the tank could not be located, the entire area was scanned with the flux-gate magnetometer.

Once the tanks and associated pipes were identified, red paint was sprayed on the ground surface identifying the outline of the subsurface structures. In areas where tank boundaries were uncertain, the painted lines were dashed, indicating the approximate location.

3.3.2 Survey Results

Exact tank boundaries could not be identified with confidence at all sites. Geophysical instruments or field observations provided reasonably accurate locations of tanks near Buildings 813, 810, 709, 253, 251, and 304. A fifth tank was identified at Building 709 during the survey. At sites near Buildings 270 and 435, the boundaries could only be approximated, because of the interference caused by abundant metal near the sites, or because the tanks were buried too deep for the magnetometers used. At the remaining sites, near Buildings 203 and 205, the tanks or tank boundaries could not be located with any confidence for similar reasons. The exact location of the tank at Building 500 was determined using a backhoe (see Section 3.4.1).

The tanks originally thought to be located near Buildings 116, 118, the second tank at 251 and one of the two steel tanks at 203 could not be identified by a geophysical survey. A site inspection of the three building areas (116, 118, and 251) revealed no evidence of existing USTs; e.g., an absence of vent pipes, full spouts, manways or other surface features associated with buried tanks. Subsequent to these site inspections and a meeting with HPA representatives, these suspected tanks were removed from the program.

Site-by-site results of the geophysical survey are included in Appendix A. Individual site maps showing locations of tanks, soil gas survey points, and soil borings are included in Figures 4-1 through 4-12.

3.4 TANK CONTENTS SAMPLING

3.4.1 Sampling Methodology

Each tank was sampled for free or floating product. This was accomplished by the use of a clear, acrylic bailer. When possible, the amount and type of free product present in the tank was determined. The depth to the bottom of the tank was also measured. Samples from similar tanks in a particular tank group were composited when liquid contents of these tanks appeared to be similar. Criteria for compositing samples included color, odor and apparent viscosity when viewed in a clear, acrylic bailer at each site. Tank S-508 was sampled after it was exposed using a backhoe because the fill pipe was constructed with two 90-degree turns which prevented access by the bailer. Table 3-1 indicates the capacity and indicated use of the tanks identified for this investigation.

Samples were transferred to approved containers (as listed in Table 3-2). All sample containers were newly purchased in accordance with EPA Superfund Sample Container Repository protocols. Each container was labeled (including information on sampling date and time, name of collector, analytical method to be used, sample location, a unique sample number, and sample matrix) and sealed with tamper-resistant custody tape. Samples were immediately placed into insulated shipping containers cooled with ice to 4°C. All samples were transported, under proper chain-of-custody procedures, to the laboratory within 24 hours. All sampling equipment was cleaned prior to sampling and between each sample location. The procedure used for decontamination included:

- Brush scrub with low alkaline, non-phosphate detergent solution
- Rinse with deionized water
- Double rinse with ASTM Type 2/HPLC water.

A total of 17 samples were collected and sent to the laboratory for analysis.

3.4.2 Laboratory Analysis of Contents

Samples of tank contents were sent to the IT Cerritos laboratory for analysis for characterization of volatile organic compounds using EPA Method 8240. Samples were also analyzed for low boiling point and high boiling point hydro-

carbons, using a modified EPA Method 8015 with detection limits included in Table 3-3. Table 3-4 shows analytical results for all tanks sampled. The table also lists the predominant product interpreted by field observations and analytical "fingerprinting." In 10 of the samples collected, the concentration of product exceeded analytical capabilities. Field observations indicated almost pure product.

TABLE 3-1
UNDERGROUND TANKS AT
HUNTERS POINT ANNEX
CAPACITIES AND INDICATED USE

TANK NO.	LOCATION	GALLONS[1]	CONTENTS	TYPE	NUMBER OF LOCATIONS SOIL GAS	NUMBER OF LOCATIONS SOIL BORINGS
S-001	Bldg. 253	3,000	Gasoline	Steel }		
S-002	Bldg. 253	3,000	Gasoline	Steel }	8	
S-003	Bldg. 253	3,000	Gasoline	Steel }	total	
S-004	Bldg. 253	3,000	Gasoline	Steel }		
S-209	Bldg. 203	210,000	Fuel Oil	Concrete		1
S-212	Bldg. 203	4,500	Gasoline	Steel	2	1
S-213	Bldg. 203	35,000	Treated Water	Concrete		2
S-214	Bldg. 205	21,924	Fuel Oil	Steel	0	1
S-215	Bldg. 270	25,320	Paint Thinner	Steel	4	
S-251	Bldg. 251	750	Solvent	Steel	3	
S-304	Bldg. 304	6,880	Gasoline	Steel	2	
S-305	Bldg. 304	6,880	Gasoline	Steel	2	
S-435(1)	Bldg. 435	750	Mixed -	Steel	2	
S-435(2)	Bldg. 435	750	Solvent & Gasoline	Steel	2	
S-508	Bldg. 500	750	Fuel Oil	Steel	0	2
S-711	Bldg. 709	5,000	Gasoline	Steel }		
S-712	Bldg. 709	5,000	Gasoline	Steel }	6	
S-713	Bldg. 709	5,000	Gasoline	Steel }	total	
S-714	Bldg. 709	5,000	Diesel	Steel }		
S-715	Bldg. 709	500	Waste Oil	Steel	2	
S-801	Bldg. 810	10,800	Diesel	Steel	0	2
S-802	Bldg. 810	6,880	Fresh Water/ Diesel	Steel	0	2
S-812	Bldg. 813	10,000	Fuel Oil	Steel	0	2
				TOTALS	33	13

[1] Capacity data based on information supplied to IT by WESTDIV.

(1) Denotes individual tank within a tank group.

TABLE 3-1A

UNDERGROUND TANKS AT
HUNTERS POINT ANNEX

TANK NO.	BUILDING NO.	DEPTH TO TANK BOTTOM	AMOUNT OF LIQUID	MATERIAL OF CONSTRUCTION	TANK CAPACITY
S-001	253	7 FT. 6 IN	DRY	STEEL	3,000 GAL
S-002	253	7 FT. 6 IN	2 INCHES	STEEL	3,000 GAL
S-003	253	7 FT. 6 IN	DRY	STEEL	3,000 GAL
S-004	253	7 FT. 6 IN	2 INCHES	STEEL	3,000 GAL
S-209	203	UNKNOWN	NEARLY FULL	CONCRETE	210,000 GAL
S-212	203	7 FT. 6 IN	UNKNOWN	STEEL	4,500 GAL
S-213	203	UNKNOWN	NEARLY FULL	CONCRETE	35,000 GAL
S-214	205	UNKNOWN	UNKNOWN	STEEL	21,924 GAL
S-215	270	UNKNOWN	UNKNOWN	STEEL	25,320 GAL
S-251	251	6 FT. 2 IN	3 FT. 10 IN	STEEL	750 GAL
S-304	304	7 FT. 6 IN	2 INCHES	STEEL	6,880 GAL
S-305	304	7 FT. 6 IN	2 INCHES	STEEL	6,880 GAL
S-435 (1)	435	7 FT.	3 FT. 8 IN	STEEL	750 GAL
S-435 (2)	435	7 FT.	3 FT. 8 IN	STEEL	750 GAL
S-508	500	UNKNOWN	UNKNOWN	STEEL	750 GAL
S-711	709	11 FT. 6 IN	1 INCH	STEEL	5,000 GAL
S-712	709	11 FT. 6 IN	3 FEET	STEEL	5,000 GAL
S-713	709	11 FT. 6 IN	3 INCHES	STEEL	5,000 GAL
S-714	709	11 FT. 6 IN	3 FT. 10 IN	STEEL	5,000 GAL
S-715	709	8 FT.	1 FOOT	STEEL	500 GAL
S-801	810	14 FT. 2 IN	2 FT. 6 IN	STEEL	10,880 GAL
S-802	810	13 FEET	1 FT. 10 IN	STEEL	6,880 GAL
S-812	813	12 FT. 3 IN	4 FT. 10 IN	STEEL	10,000 GAL

Amount of floating product vs "aqueous" was not determined.
Dates of tank installation and usage not available.
Tank assumed to be 3 feet below surface.
Physical dimension of tanks not available.

TABLE 3-2

SAMPLE CONTAINERS, PRESERVATIVES,

AND HOLDING TIMES

ANALYSIS	SAMPLE TYPE	CONTAINER	PRESERVATIVE	HOLDING TIME
Volatile Organic Compounds	Water	2-40 mL amber glass vials Teflon-backed septum No head space	Cool to 4°C add 2 drops 1:1 HCl	14 days
	Soil	Brass sleeve or 250 mL glass jar	Cool to 4°C	14 days
Total Petroleum Hydrocarbons - Volatiles	Water	2-40 mL vials Teflon-backed septum No head space	Cool to 4°C add 2 drops 1:1 HCl	14 days
	Soil	1 sleeve, brass	Cool to 4°C	14 days
Total Petroleum Hydrocarbons - Semi & Non Volatile	Water	2-40 mL vials Teflon-backed septum No head space	Cool to 4°C add 2 drops 1:1 HCl	14 days to extract; analysis within 40 days
	Soil	1 sleeve, brass	Cool to 4°C	14 days to extract; analysis within 40 days
Tetraethyl lead	Water	1 L poly	Cool to 4°C	14 days
	Soil	1 sleeve, lexan	Cool to 4°C	14 days
Ethylene dibromide	Water	2-40 mL vials Teflon-backed septum No head space	Cool to 4°C add 2 drops 1:1 HCl	14 days
	Soil	brass sleeve	Cool to 4°C	14 days

Reference: Project Plan for Underground Tank Investigation at Naval Station Treasure Island, Hunters Point Annex, San Francisco, California. Volume III: Quality Assurance/ Quality Control Plan.

TABLE 3-3

ANALYTICAL DETECTION LIMITS[a,b]

PARAMETER	METHOD NO.	LOW[e] WATER[c]	METHOD NO.	LOW[e] SOIL/SEDIMENT[d]
Total Petroleum Hydrocarbons	MODIFIED EPA 8015	0.5 (mg/L)	MODIFIED EPA 8015	10.0 (mg/kg)
Volatile Organics	EPA 8240	5.0 or 10.0 (µg/l)[f]	NA	NA

[a] Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable. See laboratory reports, Appendix D, for actual limits.

[b] Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the contract, will be higher.

[c] Medium Water Contract Required Detection Limits (CRDL) for Volatile Target Compounds List (TCL) Compounds are 100 times the individual Low Water CRDL.

[d] Medium Soil/Sediment Contract Required Detection Limits (CRDL) for Volatile TCL Compounds are 100 times the individual Low Soil/Sediment CRDL.

[e] CLP Definition, <10 ppm of target compound.

[f] Detection limit dependent on specific compound. See laboratory reports, Appendix D, for actual limits.

TABLE 3-4

TANK CONTENTS SAMPLING RESULTS

SAMPLE NUMBER	LOCATION OF SAMPLE BLDG / TANK	PRODUCT DESCRIPTION	RESULTS OF ANALYSES MODIFIED EPA 8015 mg/ℓ	EPA 8240 µg/ℓ
HPA-1	813/S-812	Fuel Oil	760,000	
HPA-2	810/S-801	Diesel	>950,000	
HPA-3	810/S-802	Diesel/Water	860,000	
HPA-4	709/S-715	Mixed Wastes (Waste Oil)	ND	1500 Methylene Chloride 1800 Acetone 700 Benzene 2100 Toluene
HPA-5	709/S-711 S-712, S-713	Gasoline	400,000	
HPA-6	709/S-714	Diesel	560,000	
HPA-7	435/S-435(1)	Mixed - Solvent & Gasoline	3.5	1300 Methylene Chloride 4700 Benzene 15,000 Toluene 640 Ethyl benzene 18,000 Xylenes
HPA-8	435/S-435(2)	Mixed - Solvent & Gasoline	120	440 Methylene Chloride 3500 Xylenes
HPA-9	203/S-209	Fuel Oil	940,000	
HPA-10	203/S-213	Treated Water	ND	7 Methylene Chloride 8 Toluene 20 Xylenes
HPA-11	203/S-212	Gasoline	640,000	
HPA-12	304/S-304,S-305	Gasoline	66	
HPA-13	270/S-215	Solvent	ND	12 Methylene Chloride 29 Acetone 7 Chloroform 40 Toluene 10 Ethyl benzene 340 Xylenes
HPA-14	251/S-251	Solvent	40	130 Methylene Chloride 130 Acetone 450 Toluene 2300 Xylenes
HPA-15	205/S-214	Fuel Oil	950,000	
HPA-16	253/S-001, S-002, S-003, and S-004	Gasoline	410,000	
HPA-26*	500/S-508	Diesel	46,000	

The sample labels 17 through 25 were damaged and not used. No samples (17 to 25) were taken.

(1) Denotes individual tank within a tank group.

4.0 TASK 4 ACTIVITIES AND RESULTS

4.1 PURPOSE AND OBJECTIVE

The purpose of Task 4 was to identify those tanks which were currently leaking or which had leaked in the past. Leakage was detected using the following techniques:

- Soil gas surveys
- Soil borings and sampling
- Laboratory analysis of soil samples.

4.2 SOIL GAS SURVEYS

Soil gas surveys were conducted for all tanks or tank groups containing volatile compounds (gasoline, paint thinner) and their associated piping. Soils and backfill associated with tanks containing nonvolatile compounds (i.e., fuel oil and diesel) were sampled using a drilling rig and California modified split-spoon sampler.

Samples for soil gas were taken above ground water level since soil gas cannot be accurately sampled under saturated conditions. The ground water conditions were determined by the initial literature and data review, or from a test hole driven at each site.

A PHOTOVAC TIP I (TIP) instrument was used for the soil gas survey. The number of sampling points surveyed varied from three points for each isolated tank to eight points for a group of four tanks. Actual sampling point locations for a given tank or tank group were influenced by constraints imposed by adjacent structures and utilities.

Site maps shown in Figures 4-1, 4-3B, 4-5, 4-6, 4-7, 4-8, and 4-10 include the position of tanks and piping (as ascertained through drawings and the geophysical surveys) and the positions of soil gas survey points taken at each site.

4.2.1 Methodology of Soil Gas Surveys

Sampling of volatile organic compounds (VOC) was accomplished by driving a 3/8-inch-diameter steel rod into the ground to depths ranging from five to

ten feet. The steel rod was then removed and a sampling probe (a perforated, 1/4-inch-stainless-steel tube) was inserted into the resulting hole. The annular space between the probe and the ground perforation was sealed. A Teflon™ tube connected the top of the buried probe to a mechanical vacuum pump which was used to withdraw the soil gas.

Soil gas samples were collected and analyzed with a Photovac, photoionization detector for total ionizables present. The TIP measures total ionizable compounds relative to an isobutylene standard and has an equipment resolution of 1.0 ppm. Where TIP measurements were greater than ambient background levels, a soil gas sample was collected in a Tedlar™ bag for analysis by a gas chromatograph (GC). The GC analysis was conducted to quantify the following compounds: 1,1-DCE; 1,1-DCA; cis-DCE; 1,1,1-TCA; TCE; 1,1,2-TCA; benzene; toluene; m-xylene; and o-xylene.

After each reading, the TIP was thoroughly aerated until its decontamination was complete, as defined by achieving either zero or ambient background levels. The steel driving rod, perforated sampling probe and teflon tubing were decontaminated between each site using the following procedures.

- Brush scrub with low alkaline, non-phosphate detergent solution
- Rinse with deionized water
- Double rinse with ASTM Type 2/HPLC water.

4.2.2 Results of Soil Gas Surveys

Detection results of the soil gas surveys are listed in Table 4-1. Contaminants were detected in the backfill adjacent to all tanks that were surveyed. Appendix B includes the raw data generated from the survey. This data includes all soil gas TIP results and gas chromatograph data.

4.3 SOIL SAMPLING

Borings were drilled around those tanks identified as containing nonvolatile compounds during Task 3. The purpose of this activity was to obtain in situ samples of soil near the tanks for laboratory analysis and to determine if the tanks had leaked.

With one exception, two or four borings were done around each tank or group of tanks, respectively. Two borings allowed a sample to be taken from each end of the tank. For larger clusters, four borings allowed samples to be taken from each corner. Spreading samples in this manner improved the chances of intercepting migration routes of leaking effluent. The one exception was Tank S-214 near Building 205, where only one boring was done due to the confined access, a large number of buried utilities or metal objects and a concrete slab underlying the asphalt at the west end of the tank.

4.3.1 Drilling Method

For Task 4, drilling was restricted to shallow borings to collect soil samples for laboratory analysis and to obtain a detailed lithologic evaluation (logging) of soil surrounding the tanks.

A geologist under direct supervision of a California registered geologist visually logged each drill hole using cored samples and drill cuttings. Lithologic logs were prepared using the Unified Soil Classification System. The logs appear in Appendix C of this report.

Because of the relatively shallow soil sample requirements for this investigation, the hollow-stem auger (eight-inch outside diameter) drilling technique was used. All soil borings done during this phase were backfilled to the surface with cement grout containing 5 percent bentonite. A concrete "cap" of eight to twelve inches was placed immediately below grade in traffic areas after the cement grout had settled for 24 hours.

Soil brought to the surface from shallow auger borings, after sampling, were shoveled into DOT 17-H drums and sealed for local transportation and stored in the designated WESTDIV Hazardous Material Storage facility at Hunters Point. All drilling equipment, including augers, drill bit, sampling hammer, cables, and tools, were decontaminated prior to drilling and between each borehole. Decontamination was as follows:

- Steam clean with direct spray from a steam cleaner
- Brush scrub with low alkaline, non-phosphate detergent solution
- Rinse with deionized water
- Double rinse with ASTM Type 2/HPLC water.

Site maps showing locations of tanks with associated piping and borings are included as Figures 4-2, 4-3A, 4-3C, 4-4, 4-9, 4-11 and 4-12.

4.3.2 Soil Sampling Methodology

Samples were taken from shallow borings drilled at locations near those tanks containing nonvolatile compounds. No soil samples were taken in the saturated zone. Exact boring locations were determined on the basis of proximity of adjacent structures and buried utilities. Soil sampling attempts were made at locations near the middle of the tank or immediately above encountered ground water, which varied from 5 to 12 feet below ground surface. The soil samples were collected at a minimum of five-foot intervals. Where the first boring at a site encountered ground water above ten feet, subsequent borings on that site were sampled at closer intervals.

Soil samples were collected using a two-inch-diameter California modified split-spoon sampler. The sampler was lined with three six-inch-long decontaminated brass tubes. The sampler was driven into the bottom of the boring at the selected depth using the hydraulic force of the drilling rig or with a 140-lb slide hammer. After sampling, the tubes were extracted and one of the lower tubes selected for analysis. Where contamination of the soil was apparent (i.e., staining, odor or free phase product), the sample which appeared most contaminated was selected. The selected tube was capped (with a Teflon™-lined plastic cap), labeled, sealed at both ends with duct tape, and placed in a Ziploc® bag. The bag was then placed in an ice chest chilled to 4 degrees C with double-bagged ice cubes.

For all sampling equipment cleaned prior to sampling and between each sampling attempt, the procedure for decontamination was as follows:

- Sample Sleeves
  - Each sleeve was steamed cleaned both inside and out.
  - Each sleeve was completely scrubbed with a brush using a low alkaline, nonphosphate detergent solution.
  - Each sleeve was thoroughly rinsed with deionized water.

- The inside of each sleeve was rinsed with deionized water.
- A final ASTM Type 2/HPLC water rinse was applied to each sleeve.
- The sleeves were air-dried.
- Each set of three sleeves was stored in an individual polyethylene plastic bag to minimize atmospheric contamination.

• Core Barrel and Nose Piece

- The inside surface of the core barrel and nose piece were scrubbed with a brush using a low alkaline, nonphosphate detergent solution.
- The nose piece was given a final rinse using ASTM Type 2/HPLC water.
- The equipment was thoroughly rinsed with deionized water and air-dried.

One sample from each soil boring was selected to be analyzed for semi-volatile and high boiling point hydrocarbons using modified EPA Method 8015. Laboratory analyses were performed according to tank contents as listed in the Statement of Work and confirmed by field observation. Analytical methods are listed in Table 4-2; analytical detection limits in Table 4-3; and sample containers, preservatives, and holding times in Table 3-2.

Soil samples were shipped to the IT laboratory in Cerritos, California, for chemical analysis in sealed, insulated containers cooled with ice to 4° C. Chain-of-Custody and Request-for-Analysis procedures were followed in accordance with Volume III: Quality Assurance/Quality Control Plan, of the four volume Project Plan.

4.3.3 Results of Soil Sampling

Detection results of the laboratory analyses are summarized in Table 4-4. Five of the six tank sites sampled indicated at least some contamination by compounds similar to those known to be in tanks in the soil adjacent to the tanks. Observations made in the field during drilling operations also suggest contamination has occurred. The observations included soil staining, strong petroleum odors in the soil, and floating free product on the ground water surface. These observations are noted on the drilling logs in Appendix C.

The complete laboratory reports for the samples are included in Appendix D. These reports also include Quality Assurance blank and matrix spike samples.

The laboratory sample and field observations for tank S-812, near Building 813, gave no indication of contamination.

TABLE 4-1
SUMMARY TABLE OF SOIL ORGANIC VAPOR SURVEY RESULTS

BUILDING LOCATION: 253

TANK NUMBER(S): S-001, S-002, S-003, S-004

CONTENTS: Gasoline

SAMPLE LOCATION	1,1-DCE	1,1-DCA	CIS-DCE	1,1,1-TCA	BENZENE	TCE	1,1,2-TCA	TOLUENE	m- AND p-XYLENE	o-XYLENE
AS1	11,850	10,310,000	2,220,500	23,525,000	353,700	1,442,500	2,247,500	233,050	(<32,500) ND	45,590
AS2	ND	7,280	2,053	19,328	819	2,257	37,524	130	481	ND
AS3	ND	1,352	222	ND	131	1,231	ND	169	131	ND
AS4	ND	1,238	566	4,470	181	212	6,869	172	39	ND
AS5	ND	ND	ND	ND	ND	106	ND	97	57	62
AS6	8,518	979,200	97,416	128,410	25,376	170,526	(<60,600) ND	89,914	5,526	(<5,200) ND
AS7	13,520	1,305,600	141,696	478,720	38,064	772,633	(<60,600) ND	1,113,929	208,464	174,720
AS8	4,960	2,040,000	387,500	2,288,000	91,500	179,500	151,500	71,500	65,500	(<13,000) ND

Notes: 1) All results reported in parts per billion (ppb).
2) ND = not detected for detection limit of 10 ppb.
3) (<) indicates the detection limit was inflated due to high concentrations of other sample gas compounds.

TABLE 4-1
SUMMARY TABLE OF SOIL ORGANIC VAPOR SURVEY RESULTS
(CONTINUED)

BUILDING LOCATION:	TANK NUMBER(S):	CONTENTS:
203	S-212	Gasoline

SAMPLE LOCATION	1,1-DCE	1,1-DCA	CIS-DCE	1,1,1-TCA	BENZENE	TCE	1,1,2-TCA	TOLUENE	m- AND p-XYLENE	o-XYLENE
AS1	ND	600	55	ND	43	139	5,252	ND	390	259
AS2	223	ND	635	7,603	254	294	ND	624	808	250

BUILDING LOCATION:	TANK NUMBER(S):	CONTENTS:
270	S-215	Paint Thinner

SAMPLE LOCATION	1,1-DCE	1,1-DCA	CIS-DCE	1,1,1-TCA	BENZENE	TCE	1,1,2-TCA	TOLUENE	m- AND p-XYLENE	o-XYLENE
AS1	ND	ND	ND	ND	ND	ND	ND	ND	63	ND
AS2	ND	ND	ND	ND	ND	2,678	313	ND	ND	ND
AS3	ND	ND	ND	ND	ND	ND	ND	ND	39	ND
AS4	ND	ND	ND	ND	ND	ND	ND	ND	53	48

Notes: 1) All results reported in parts per billion (ppb).
2) ND = not detected for detection limit of 10 ppb.
3) (<) indicates the detection limit was inflated due to high concentrations of other sample gas compounds.

TABLE 4-1
SUMMARY TABLE OF SOIL ORGANIC VAPOR SURVEY RESULTS
(CONTINUED)

BUILDING LOCATION: 251 | TANK NUMBER(S): S-251 | CONTENTS: Solvent

SAMPLE LOCATION	1,1-DCE	1,1-DCA	CIS-DCE	1,1,1-TCA	BENZENE	TCE	1,1,2-TCA	TOLUENE	m- AND p-XYLENE	o-XYLENE
AS1	ND	68	ND	ND	19	ND	2,068	ND	242	133
AS2	ND	ND	ND	ND	ND	19	1,254	ND	183	146
AS3	ND	ND	ND	ND	ND	ND	ND	ND	44	29

BUILDING LOCATION: 304 | TANK NUMBER(S): S-304, S-305 | CONTENTS: Gasoline

SAMPLE LOCATION	1,1-DCE	1,1-DCA	CIS-DCE	1,1,1-TCA	BENZENE	TCE	1,1,2-TCA	TOLUENE	m- AND p-XYLENE	o-XYLENE
AS1	(<11,250) ND	1,370,500	156,600	1,712,700	(<15,000) ND	172,320	1,575,200	20,525	(<32,500) ND	(<32,000) ND
AS2	(<11,250) ND	2,274,500	349,548	3,168,000	93,105	212,500	(<378,750) ND	246,582	86,400	(<32,500) ND
AS3	ND	29,592	6,288	137,360	3,120	4,112	208,240	3,033	4,120	ND
AS4	8,752	1,586,400	455,840	2,593,600	98,960	311,200	4,592,800	55,200	196,992	68,408

Notes: 1) All results reported in parts per billion (ppb).
2) ND = not detected for detection limit of 10 ppb.
3) (<) indicates the detection limit was inflated due to high concentrations of other sample gas compounds.

TABLE 4-1
SUMMARY TABLE OF SOIL ORGANIC VAPOR SURVEY RESULTS
(CONTINUED)

BUILDING LOCATION:	TANK NUMBER(S):	CONTENTS:
435	S-435(1) S-435(2)	Mixed Solvents and Gasoline

SAMPLE LOCATION	1,1-DCE	1,1-DCA	CIS-DCE	1,1,1-TCA	BENZENE	TCE	1,1,2-TCA	TOLUENE	m- AND p-XYLENE	o-XYLENE
AS1	ND	211	ND	ND	25	28	3,731	63	368	250
AS2	ND	24,176	5,576	ND	4,076	31,856	ND	ND	811	378
AS3	ND	380	28	ND	53	ND	1,100	ND	47	62
AS4	ND	6,320	1,689	12,764	624	1,356	18,088	410	490	ND

Notes: 1) All results reported in parts per billion (ppb).
2) ND = not detected for detection limit of 10 ppb.
3) (<) indicates the detection limit was inflated due to high concentrations of other sample gas compounds.

TABLE 4-1
SUMMARY TABLE OF SOIL ORGANIC VAPOR SURVEY RESULTS
(CONTINUED)

BUILDING LOCATION:	TANK NUMBER(S):	CONTENTS:
709	S-711	Gasoline
	S-712	Gasoline
	S-713	Gasoline
	S-714	Diesel
	S-715	Mixed Wastes

SAMPLE LOCATION	1,1-DCE	1,1-DCA	CIS-DCE	1,1,1-TCA	BENZENE	TCE	1,1,2-TCA	TOLUENE	m- AND p-XYLENE	o-XYLENE
AS1	ND	6,409	1,042	12,046	1,825	3,056	13,248	2,994	1,152	216
AS2	11,012	1,432,280	154,216	1,521,600	25,000	115,656	1,059,840	ND	3,329	ND
AS3	(<11,250) ND	38,760,000	2,472,300	35,376,000	646,600	(<26,250) ND	(<378,750) ND	820,640	(<32,500) ND	91,000
AS4	253,500	17,085,000	1,383,750	18,920,000	228,750	1,029,000	(<716,879) ND	178,400	202,000 ND	(<81,250)
AS5	2,488	284,960	16,096	251,280	3,242	21,252	(<3,030) ND	3,700	556	122
AS6	ND	1,300	57	1,150	ND	87	4,771	ND	299	ND
AS7	ND	640	204	2,851	267	620	8,652	220	484	ND
AS8	ND	542	42	787	133	570	4,852	136	524	111.0

Notes: 1) All results reported in parts per billion (ppb).
2) ND = not detected for detection limit of 10 ppb.
3) (<) indicates the detection limit was inflated due to high concentrations of other sample gas compounds.

TABLE 4-2

ANALYTICAL METHODS

PARAMETER	METHOD NUMBER WATER	SOIL
Total Petroleum Hydrocarbons - Low Boiling Point/Gasoline+/ BTX & E	DHS METHOD[1]	DHS METHOD[1]
Total Petroleum Hydrocarbons - Semi Volatile and High Boiling Point/Diesel	EPA 8015	EPA 8015
Total Petroleum Hydrocarbons[2]	-	EPA 418.1

[1] Leaking Underground Fuel Tank (LUFT) Field Manual, December 1987, Appendix B.

[2] Performed on samples HPA-38 and HPA-39.

TABLE 4-3

ANALTYCIAL DETECTION LIMITS

VOLATILE ORGANIC COMPOUNDS

EPA METHOD 8240

PARAMETER	CAS NUMBER	DETECTION LIMITS[a,b] LOW[e] WATER[c] ug/L	LOW[e] SOIL/SEDIMENT[d] ug/Kg
Chloromethane	74-87-3	10	10
Bromomethane	74-83-9	10	10
Vinyl chloride	75-01-4	10	10
Chloroethane	75-00-3	10	10
Methylene chloride	75-09-2	5	5
Acetone	67-64-1	10	10
Carbon disulfide	75-15-0	5	5
1,1-Dichloroethene	75-35-4	5	5
1,1-Dichloroethane	75-35-3	5	5
trans-1,2-Dichloroethene	156-60-5	5	5
Chloroform	67-66-3	5	5
1,2-Dichloroethane	107-06-2	5	5
2-Butanone	78-93-3	10	10
1,1,1-Trichloroethane	71-55-6	5	5
Carbon tetrachloride	56-23-5	5	5
Vinyl acetate	108-05-4	10	10
Bromodichloromethane	75-27-4	5	5
1,1,2,2-Tetrachloroethane	79-34-5	5	5
1,2-Dichloropropane	78-87-5	5	5
trans-1,3-Dichloropropene	10061-02-6	5	5
Trichloroethene	79-01-6	5	5
Dibromochloromethane	124-48-1	5	5
1,1,2-Trichloroethane	79-00-5	5	5
Benzene	71-43-2	5	5
cis-1,3-Dichloropropene	10061-01-5	5	5
Bromoform	75-25-2	5	5
2-Hexanone	591-78-6	10	10
4-Methyl-2-pentanone	108-10-1	10	10
Tetrachloroethene	127-18-4	5	5

TABLE 4-3

ANALYTICAL DETECTION LIMITS

VOLATILE ORGANIC COMPOUNDS

(continued)

PARAMETER	CAS NUMBER	DETECTION LIMITS[a,b] LOW[e] WATER[c] ug/L	LOW[e] SOIL/SEDIMENT[d] ug/Kg
Toluene	108-88-3	5	5
Chlorobenzene	108-90-7	5	5
Ethyl benzene	100-41-4	5	5
Styrene	100-42-5	5	5
Total xylenes	1330-20-7	5	5

[a]Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable. CLP Scope of Work 785.

[b]Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the contract, will be higher.

[c]Medium Water Contract Required Detection Limits (CRDL) for Volatile TCL Compounds are 100 times the individual Low Water CRDL.

[d]Medium Soil/Sediment Contract Required Detection Limits (CRDL) for Volatile TCL Compounds are 100 times the individual Low Soil/Sediment CRDL.

[e]CLP Definition, < 10 ppm of target compound.

Reference: EPA Contract Laboratory Program (CLP), July 1987
Contract Required Detection Limits (CRDL)

TABLE 4-4

RESULTS OF SOIL SAMPLING

SAMPLE NUMBER	SITE (BUILDING)	TANK NUMBERS	SUSPECTED PRODUCT	TOTAL PETROLEUM HYDROCARBONS DETECTED (PPM)	SAMPLE BORING & DEPTH (FT)
HPA-27	500	S-508	Fuel Oil	90	508(1) @ 4.5
HPA-28				ND	508(2) @ 6.0
HPA-29	205	S-214	Fuel oil	650	214(1) @ 5.0
HPA-30	810	S-801 +	Diesel	ND	801(1) @ 5.0
HPA-31		S-802		160	801(1) @ 8.0
HPA-32				ND	801(2) @ 5.0
HPA-33				ND	801(2) @ 8.0
HPA-34				ND	801(3) @ 5.0
HPA-35				ND	801(4) @ 5.0
HPA-36				ND	801(4) @ 8.5
HPA-37	813	S-812	Fuel Oil		812(1)[a]
				ND	812(2) @ 3.5
HPA-38	203	S-209	Fuel Oil	120	209(1) @ 5.0
HPA-39				4	209(2) @ 5.0
HPA-40				ND	209(2) @ 6.5
HPA-41	203	S-213	Treated Water		213(1)[b]
				ND	213(2) @ 5.0

ND = Not Detected

---

[a]Sample from boring 812(1) was not attempted as shallow ground water was encountered before planned sampling depth.

[b]Sample from boring 213(1) was attempted but not recovered.

(1) Denotes number of soil boring at the location.

N	J.A.C. 3-17-89	CHECKED BY	SJH 11-29-89	DRAWING NUMBER	40 7-A15
		APPROVED BY	JF 11-29-89		

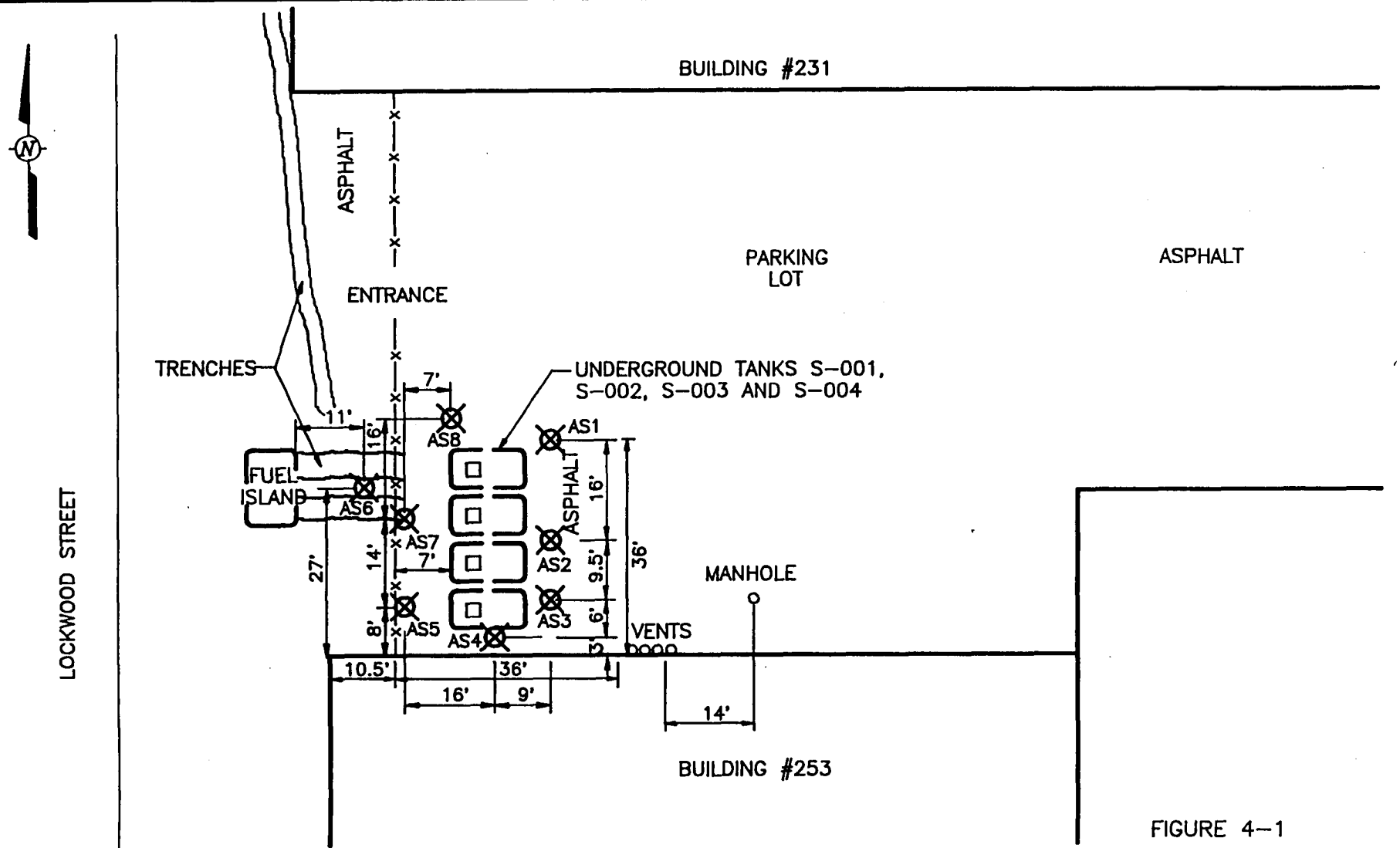


FIGURE 4-1

SOIL GAS SAMPLE LOCATION MAP
UNDERGROUND STORAGE TANKS
AT BUILDING #253

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

DWG. NOT TO SCALE

LEGEND:

⊗ SOIL GAS BORING

INTERNATIONAL TECHNOLOGY CORPORATION

HP-253(*HP2)

DRAWN	J.A.C. 11-14-89	CHECKED BY	SJH 11-29-89	DRAWING NUMBER	409[illegible]7-A11
		APPROVED BY	JC 11-29-89		

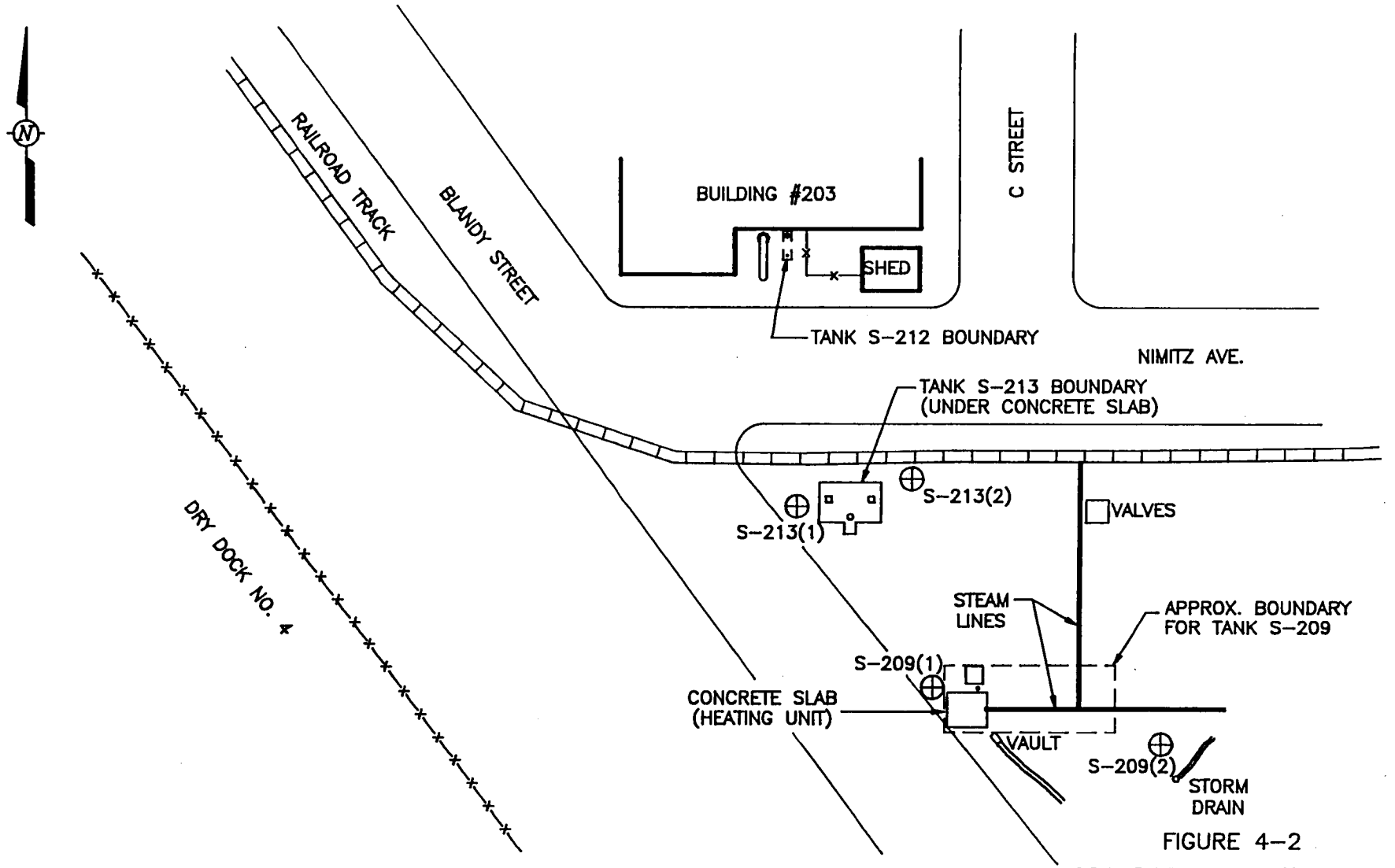


FIGURE 4-2

SOIL BORING LOCATION MAP
UNDERGROUND STORAGE TANKS
AT BUILDING #203

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

LEGEND:

⊕ DRILLING LOCATION

DWG. NOT TO SCALE

INTERNATIONAL TECHNOLOGY CORPORATION

HP-203C(*HP2)

DR BY	J. BERA	CHECKED BY	SJH 11-24-89	DRAWING NUMBER	409-A29
	11-14-89	APPROVED BY	JE 11-29-89		

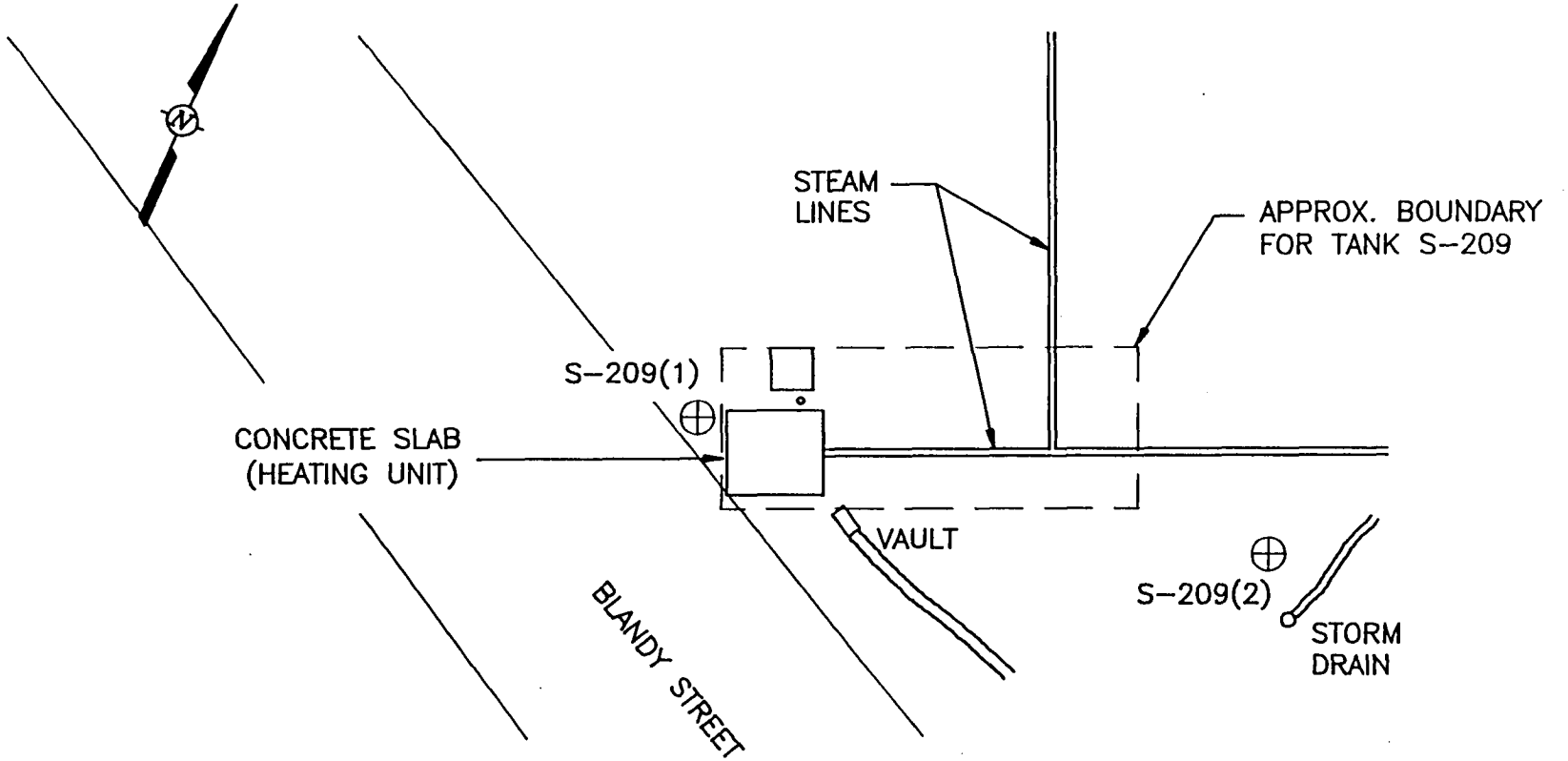


FIGURE 4-3A

SOIL BORING LOCATION MAP
UNDERGROUND STORAGE TANK
AT BUILDING #203
PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

DWG. NOT TO SCALE

LEGEND:

⊕ DRILLING LOCATION

INTERNATIONAL TECHNOLOGY CORPORATION

DRAWN	J.A.C. 3-17-89	CHECKED BY	SJH 11-29-89	DRAWING NUMBER	40[illegible]7-A12
		APPROVED BY	JF 11-29-89		

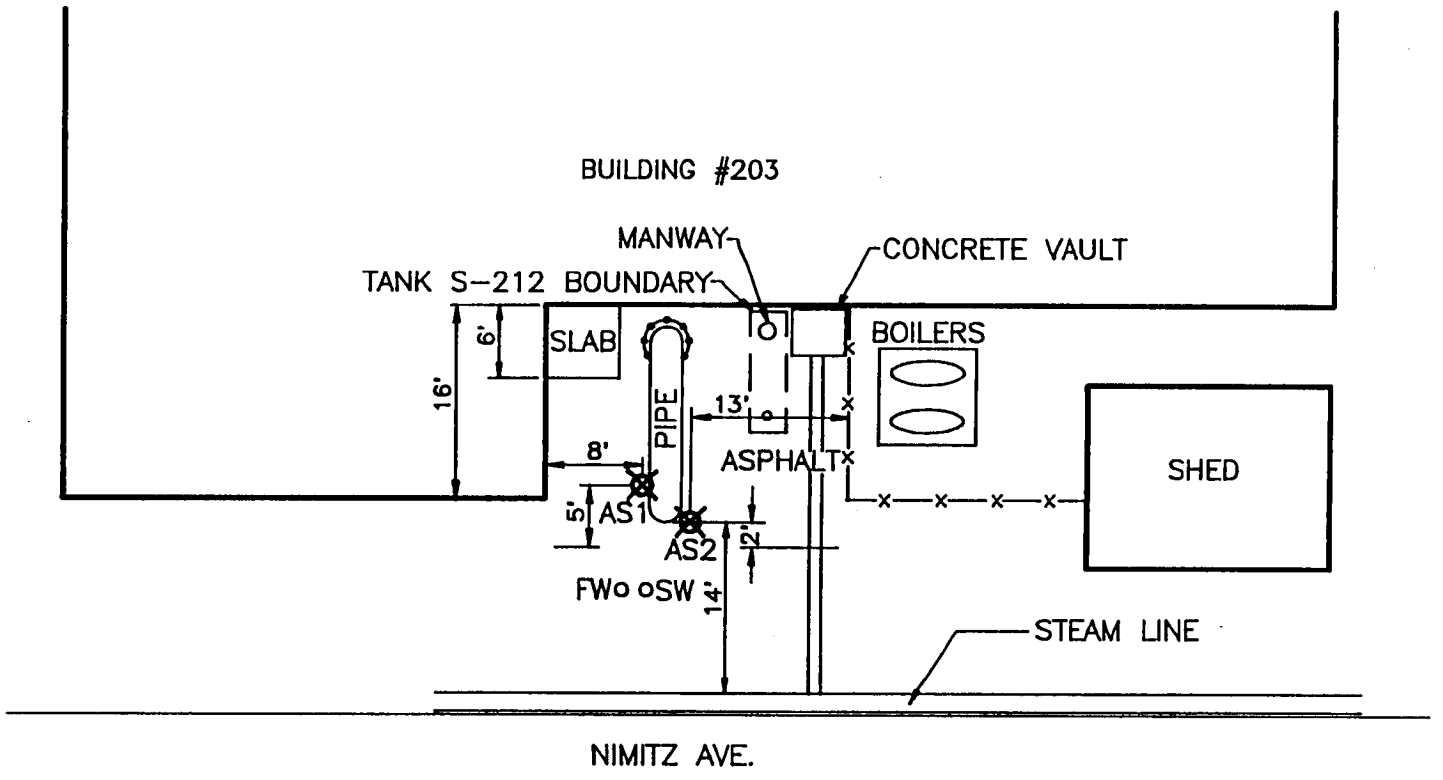


FIGURE 4-3B

SOIL GAS SAMPLE LOCATION MAP
UNDERGROUND STORAGE TANK
AT BUILDING #203

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

LEGEND:

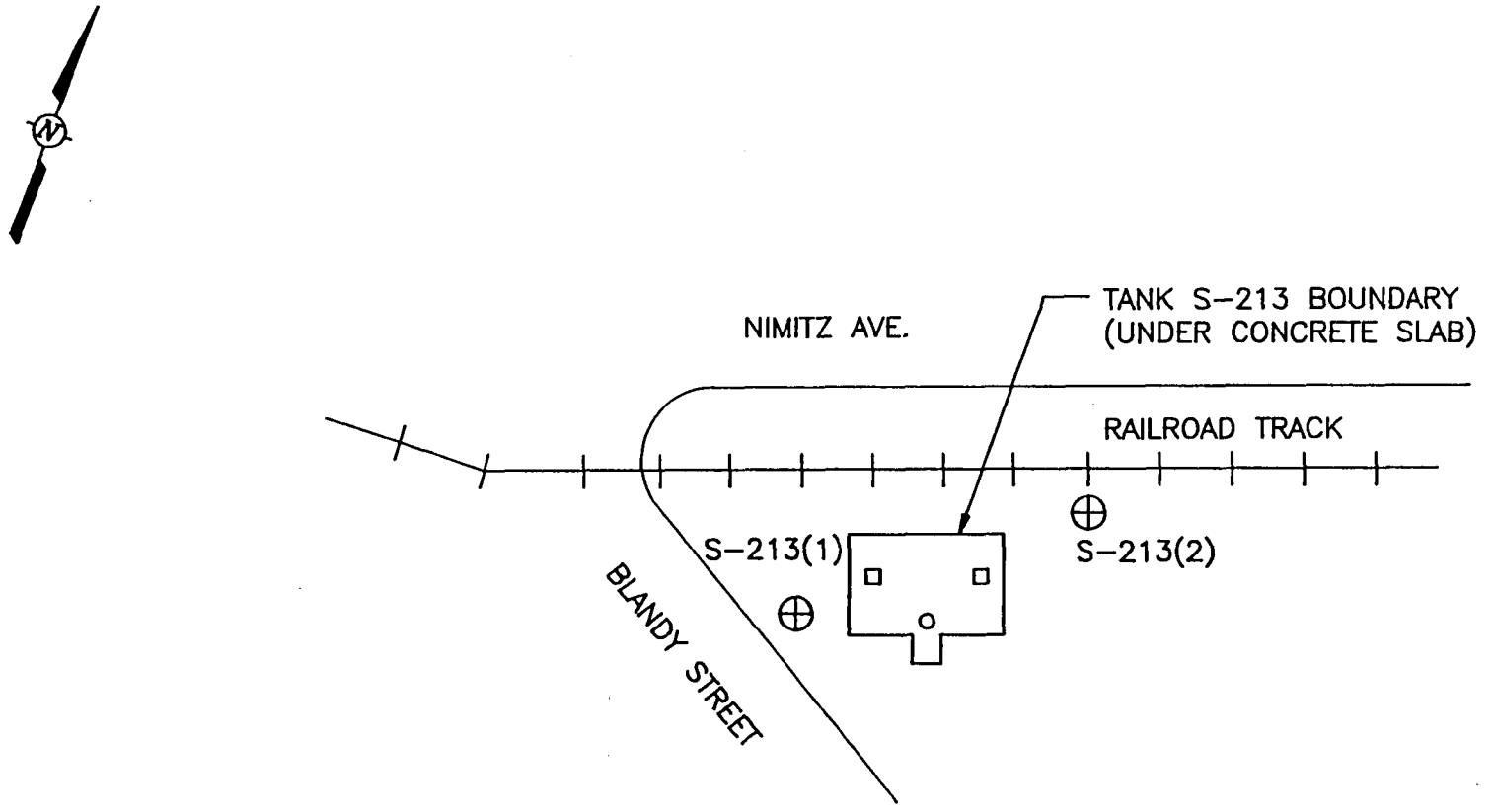
⊠ SOIL GAS BORING

DWG. NOT TO SCALE

INTERNATIONAL TECHNOLOGY CORPORATION

HP-203B(*HP3)

DRAWN BY	J. BERA	CHECKED BY	SJH 11-29-89	DRAWING NUMBER	4096 A30
	11-14-89	APPROVED BY	JE 11-29-89		



DWG. NOT TO SCALE

LEGEND:

⊕ DRILLING LOCATION

FIGURE 4-3C

SOIL BORING LOCATION MAP
UNDERGROUND STORAGE TANKS
AT BUILDING #203

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

INTERNATIONAL TECHNOLOGY CORPORATION

HP-203CC(*HP1)

DRAWN BY	J.A.C. 3-21-89	CHECKED BY / APPROVED BY	12-6-89 / 12-6-89	DRAWING NUMBER	409617-A7

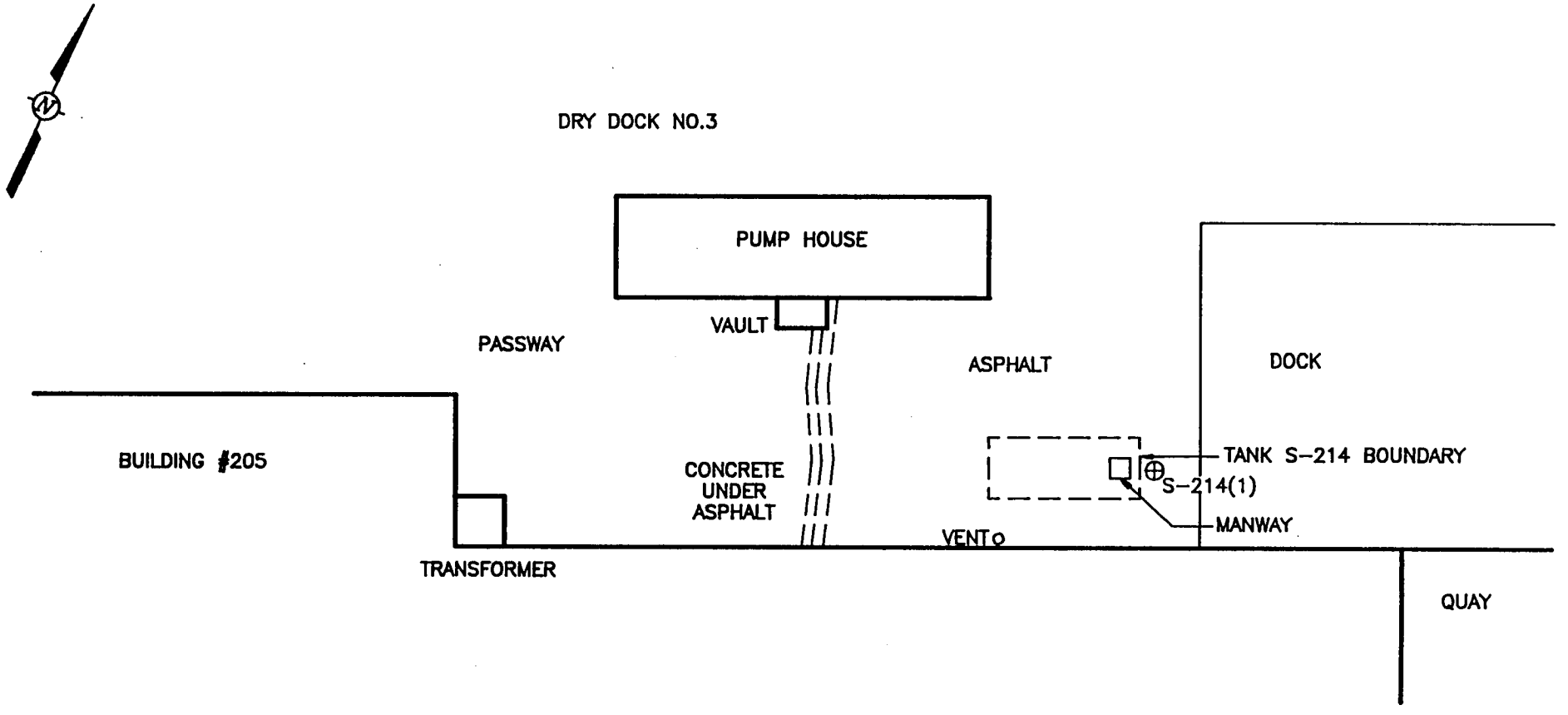


FIGURE 4-4

SOIL BORING LOCATION MAP
UNDERGROUND STORAGE TANK
AT BUILDING #205
PREPARED FOR
HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

DWG. NOT TO SCALE

LEGEND:

⊕ DRILLING LOCATION

INTERNATIONAL TECHNOLOGY CORPORATION

HP-205B(*HP1)

WN	J.A.C.	CHECKED BY	SJF-H 11-24-89	DRAWING NUMBER	4( )17-A13
	3-17-89	APPROVED BY	JF 11-24-89		

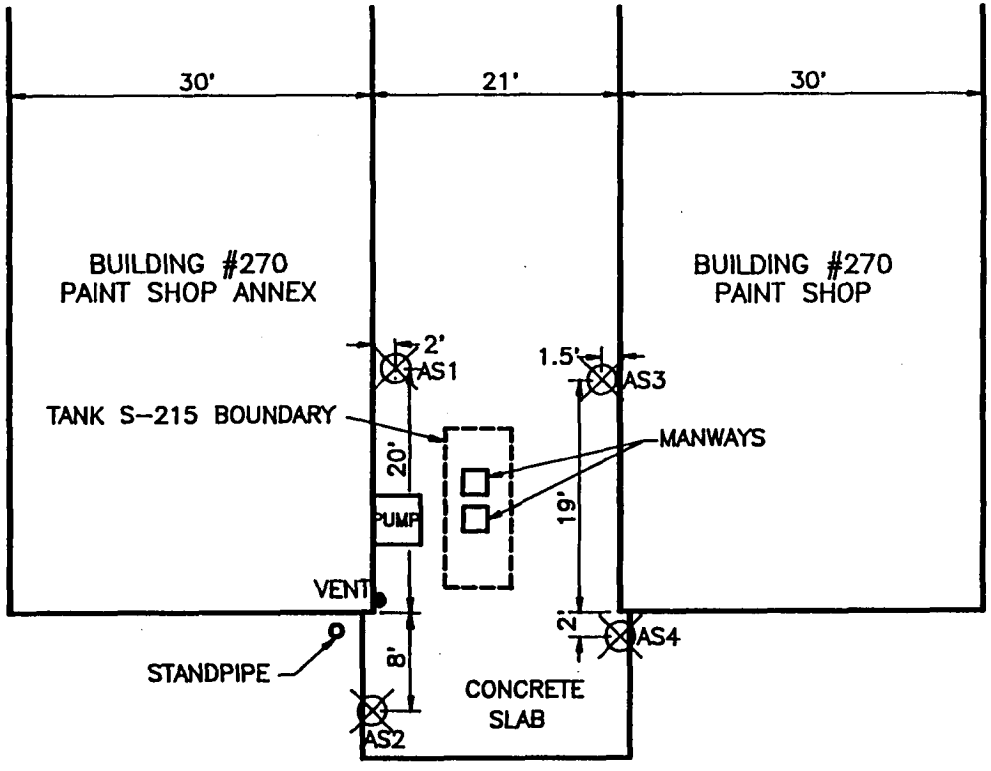


FIGURE 4-5

SOIL GAS SAMPLE LOCATION MAP
UNDERGROUND STORAGE TANK
AT BUILDING #270

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

LEGEND:

⊗ SOIL GAS BORING

DWG. NOT TO SCALE

INTERNATIONAL TECHNOLOGY CORPORATION

HP-270B(*HP1)

DRAWN	J.A.C. 3-17-89	CHECKED BY	SJH 11-29-89	DRAWING NUMBER	40[illegible]17-A4
		APPROVED BY	JF 11-29-89		

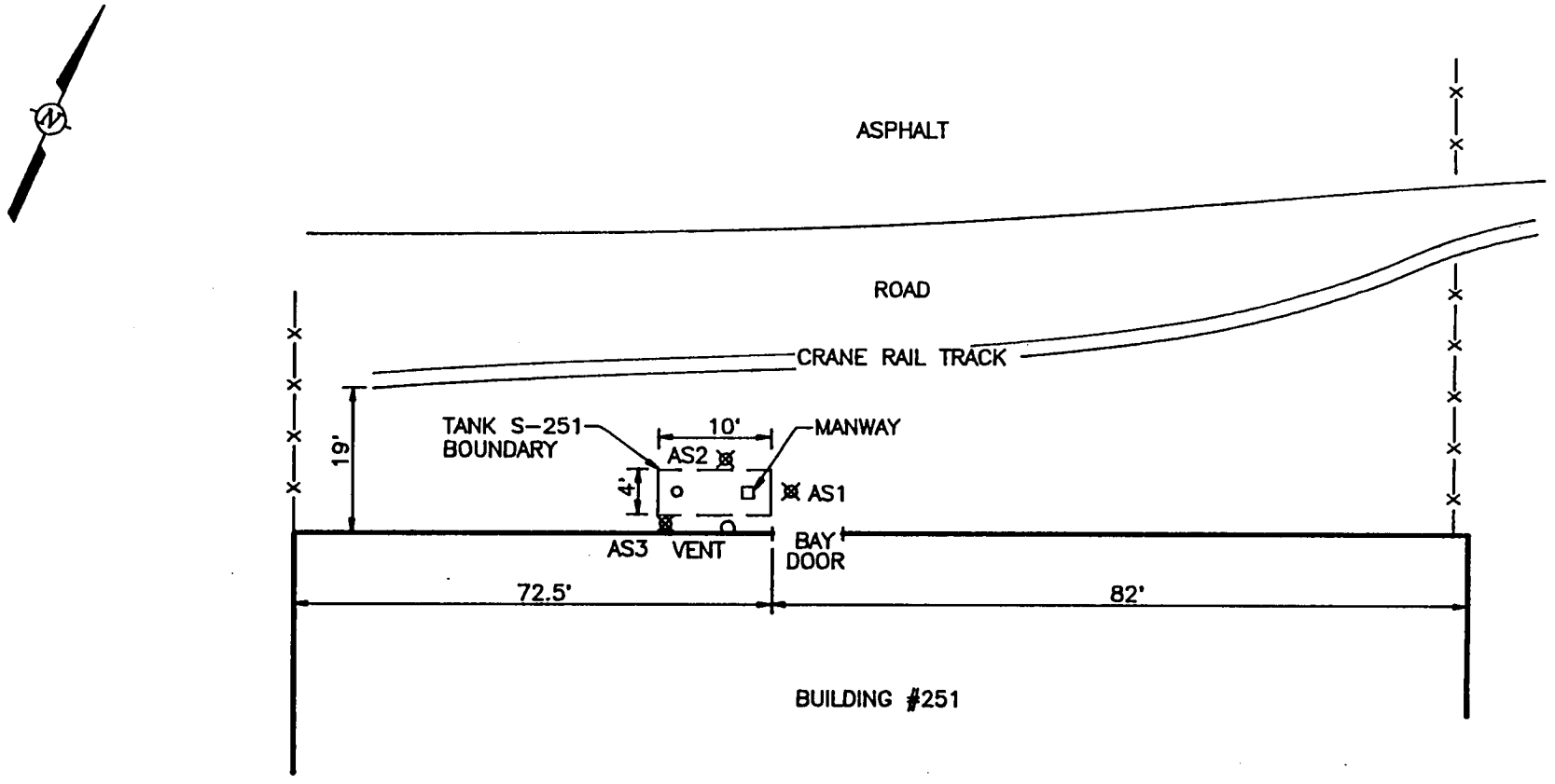


FIGURE 4-6

SOIL GAS SAMPLE LOCATION MAP
UNDERGROUND STORAGE TANK
AT BUILDING #251

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

LEGEND:

⊠ SOIL GAS BORING

DWG. NOT TO SCALE

INTERNATIONAL TECHNOLOGY CORPORATION

HP-251B(*HP1)

DRAWN	J.A.C.	CHECKED BY	SJH 11-24-89	DRAWING NUMBER	40[illegible]17-A9
	3-17-89	APPROVED BY	JC 11-24-89		

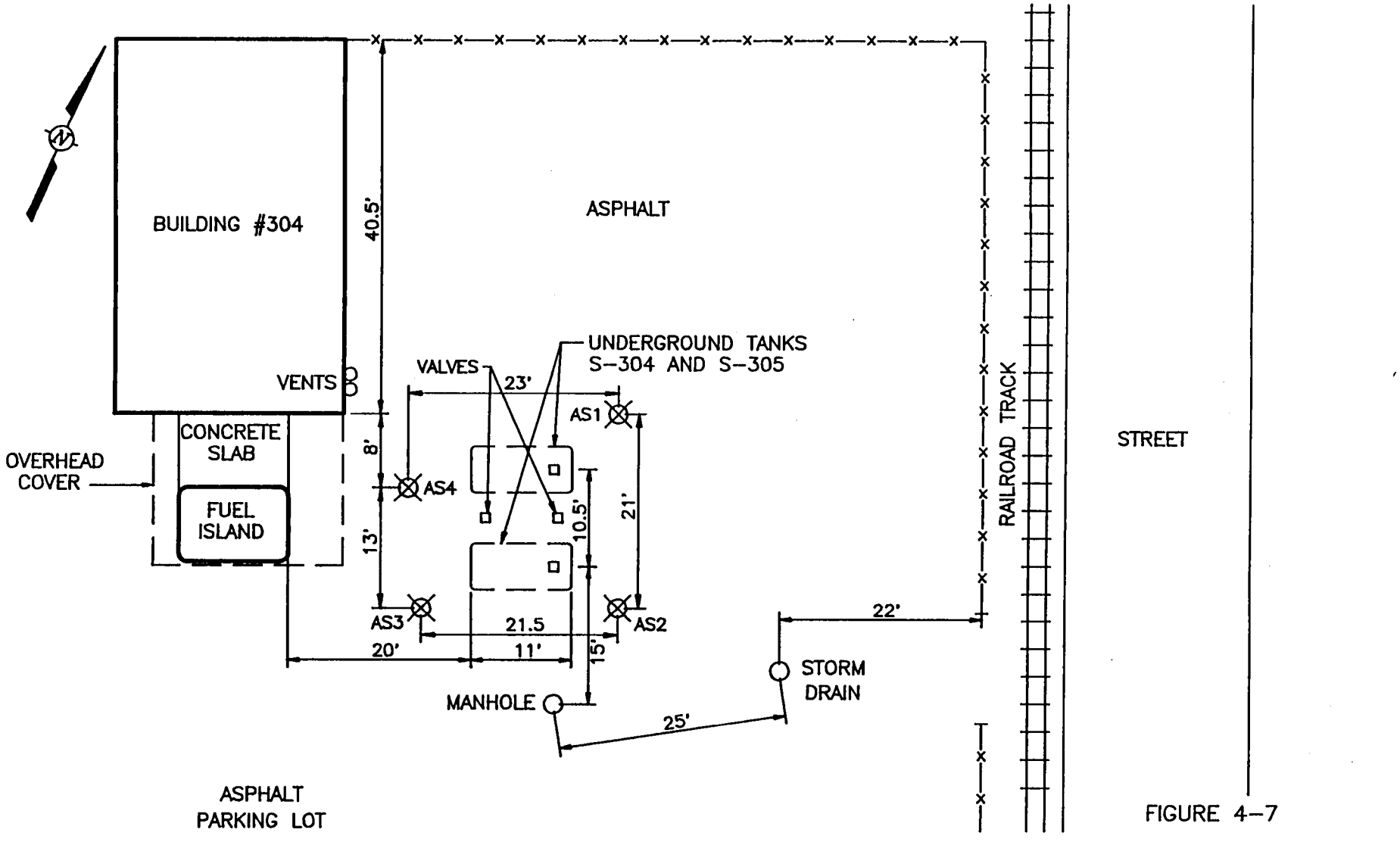


FIGURE 4-7

SOIL GAS SAMPLE LOCATION MAP
UNDERGROUND STORAGE TANKS
AT BUILDING #304

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

LEGEND:

⊗ SOIL GAS BORING

DWG. NOT TO SCALE

INTERNATIONAL TECHNOLOGY CORPORATION

HP-304(*HP2)

DRAWN	J.A.C. 4-14-89	CHECKED BY APPROVED BY	SJH 11-29-89 JC 11-29-89	DRAWING NUMBER	409[illegible]7-A5

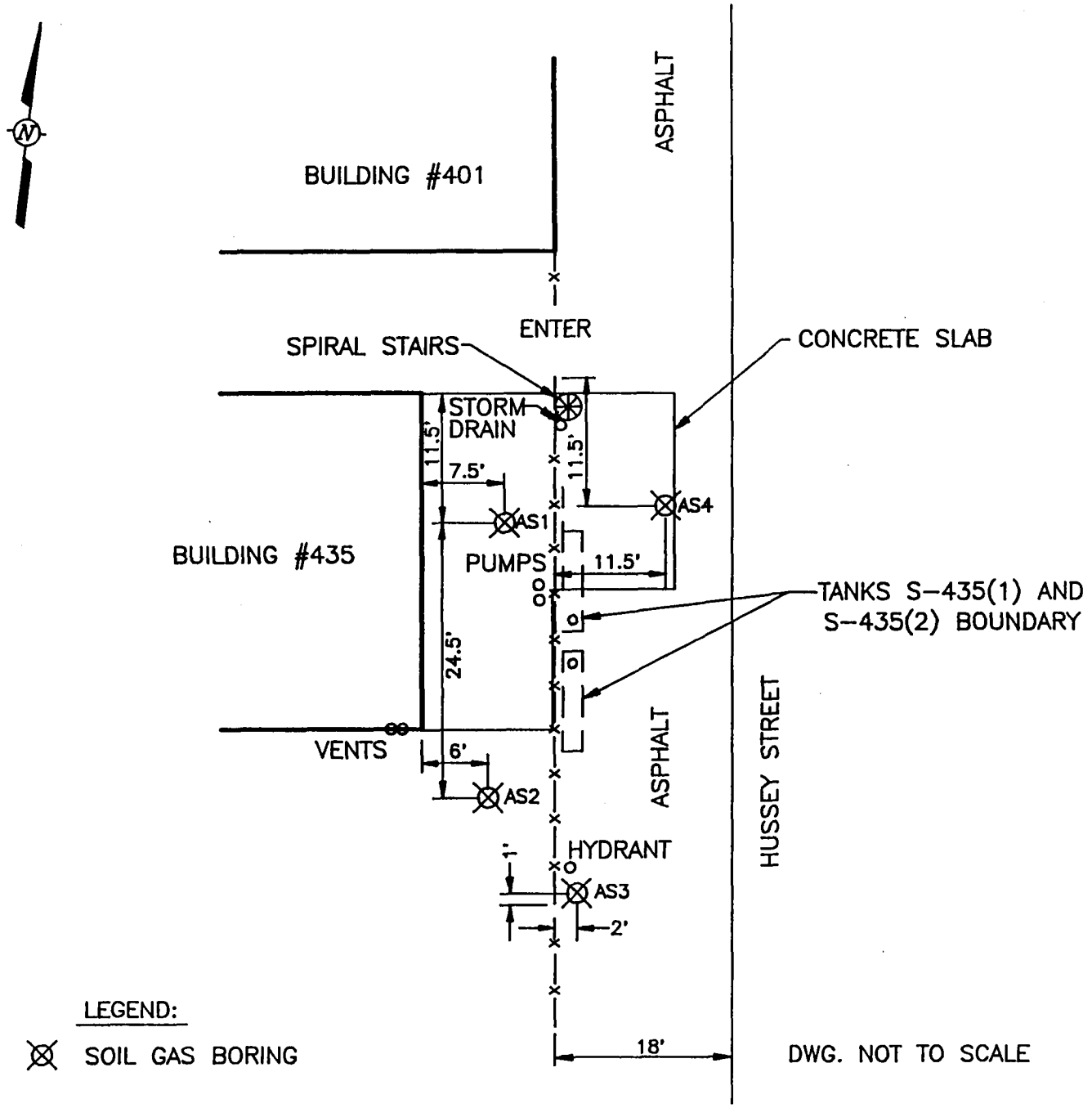


FIGURE 4-8

SOIL GAS SAMPLE LOCATION MAP
UNDERGROUND STORAGE TANKS
AT BUILDING #435

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

INTERNATIONAL TECHNOLOGY CORPORATION

HP-435(*HP-2)

DRAWN	J.A.C.	CHECKED BY	SSH 11-29-89	DRAWING NUMBER	4007-A10
	3-21-89	APPROVED BY	JE 11-29-89		

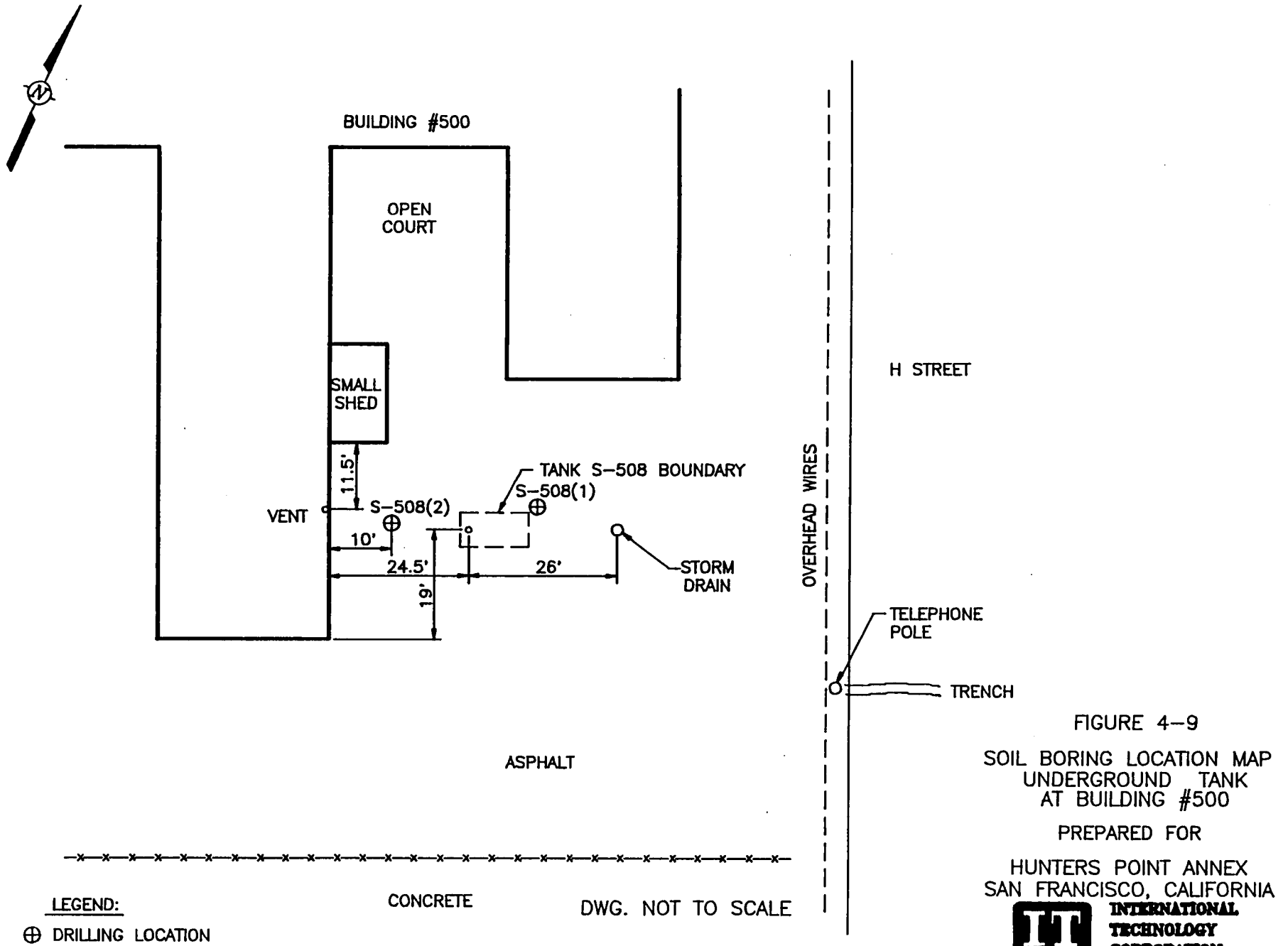


FIGURE 4-9

SOIL BORING LOCATION MAP
UNDERGROUND TANK
AT BUILDING #500

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

INTERNATIONAL TECHNOLOGY CORPORATION

HP-500(*HP2)

DRAWN BY	J.A.C.	CHECKED BY	SH 11-29-89	DRAWING NUMBER	617-A14
	3-17-89	APPROVED BY	JF 11-29-89		

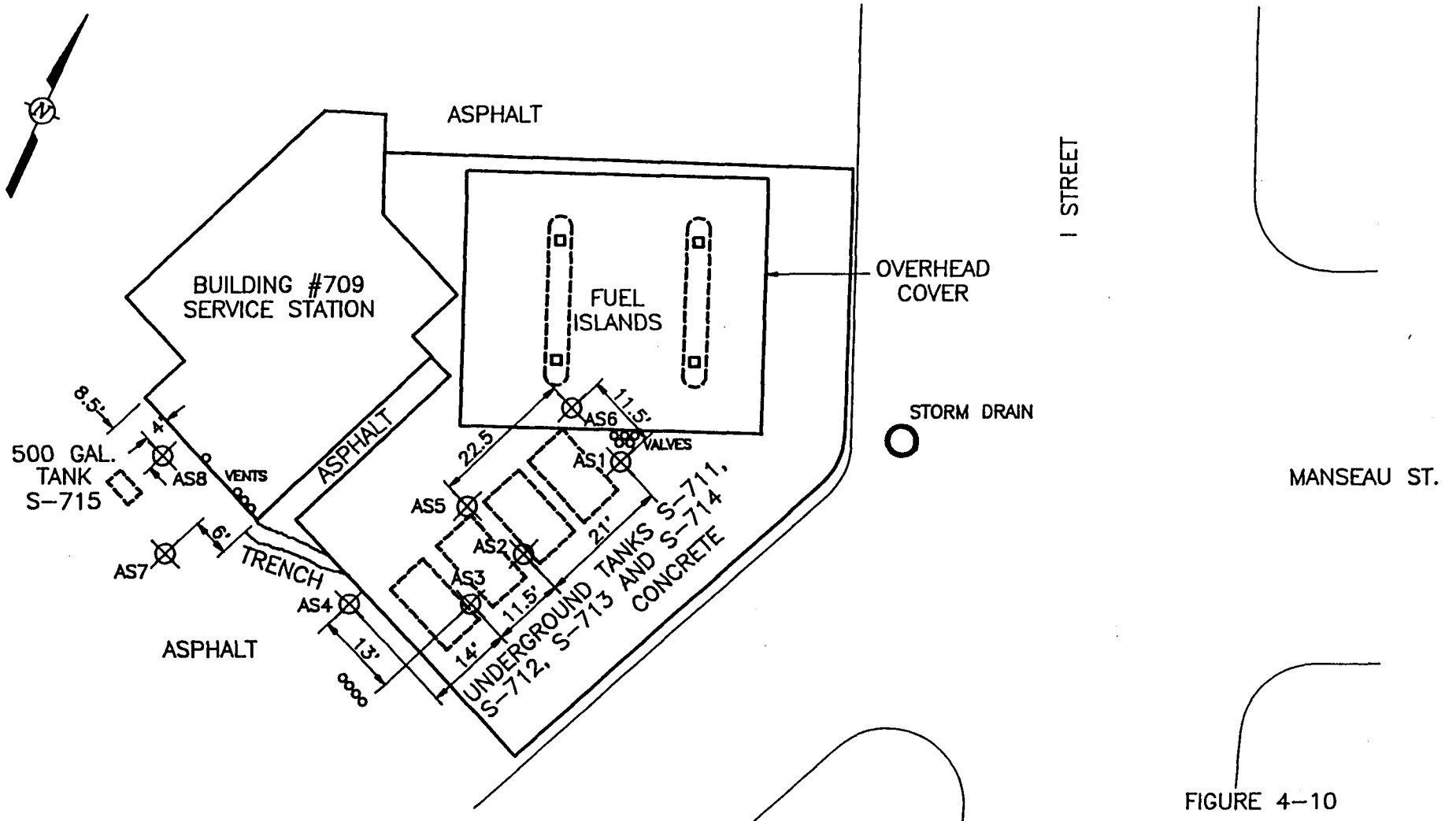


FIGURE 4-10

SOIL GAS SAMPLE LOCATION MAP
UNDERGROUND STORAGE TANKS
AT BUILDING #709

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

LEGEND:

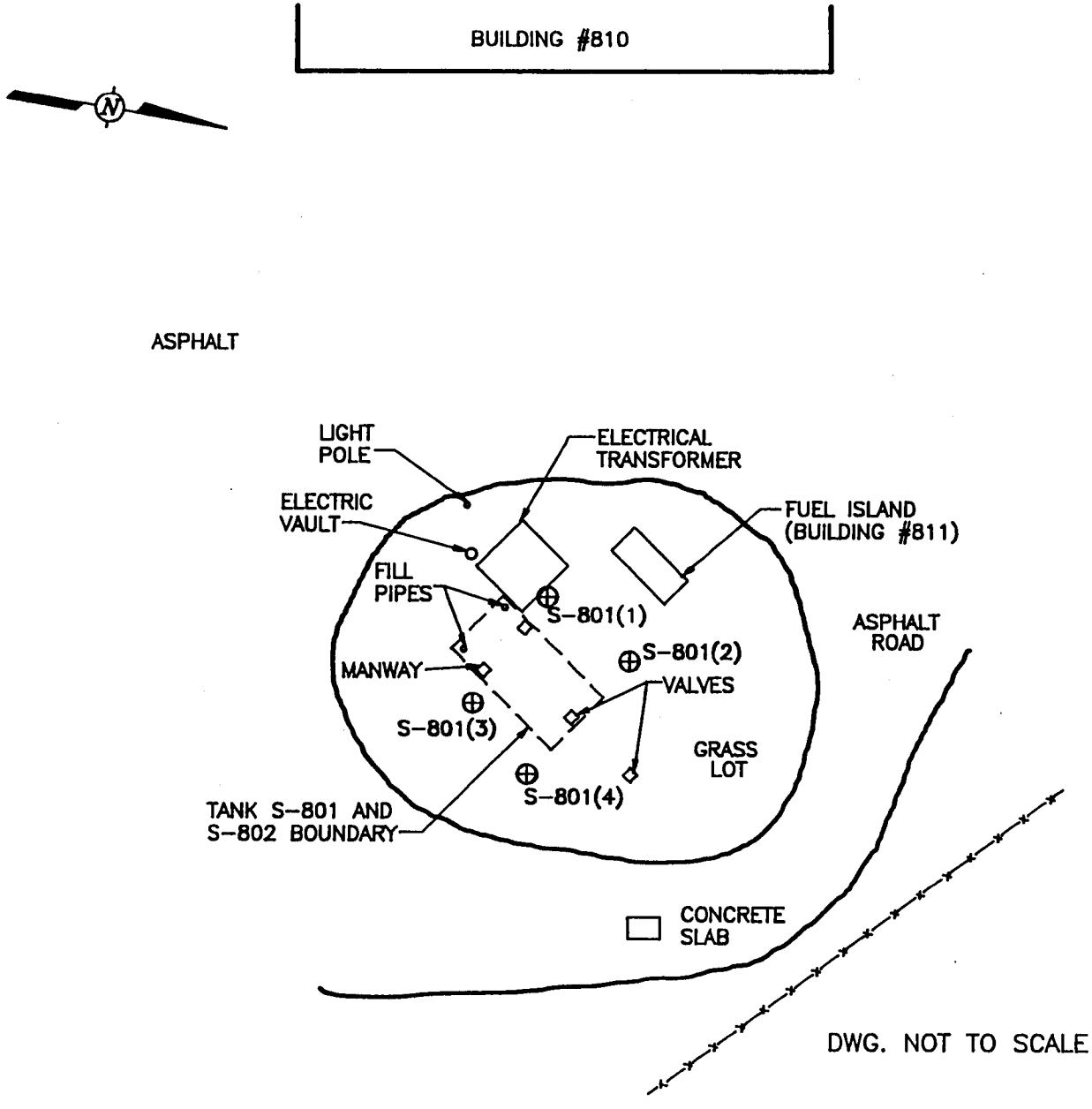
⊗ SOIL GAS BORING

DWG. NOT TO SCALE

INTERNATIONAL TECHNOLOGY CORPORATION

HP-709(*HP2)

DRAWN	J.A.C. 3-21-89	CHECKED BY	SJH 11-29-89	DRAWING NUMBER	40[illegible]7-A8
		APPROVED BY	JF 11-29-89		



NOTE:

HUNTERS POINT–
HAZARDOUS MATERIALS
STORAGE AREA

LEGEND:

⊕ DRILLING LOCATION

FIGURE 4–11

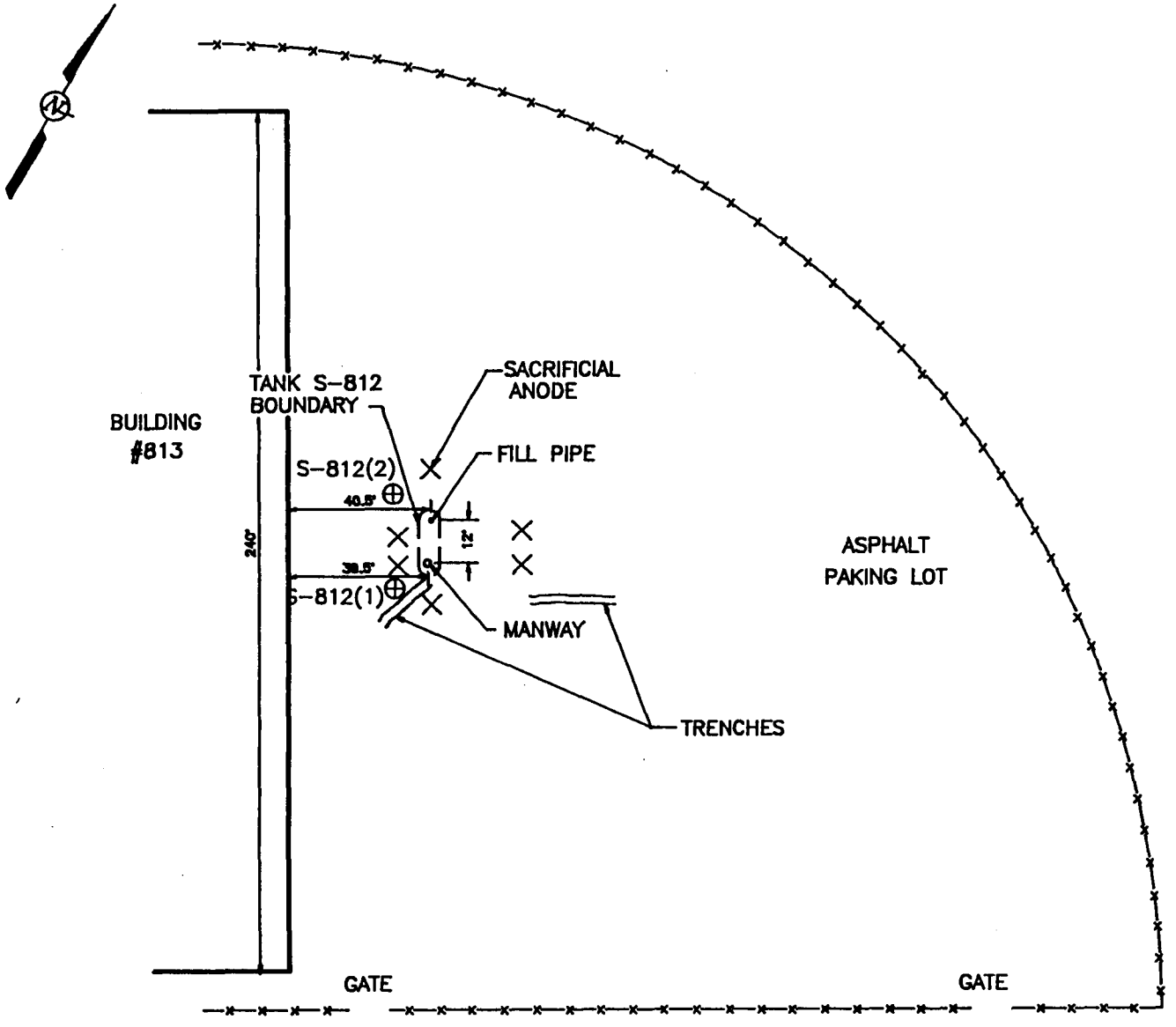
SOIL BORING LOCATION MAP
UNDERGROUND STORAGE TANKS
AT BUILDING #810

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

INTERNATIONAL TECHNOLOGY CORPORATION

DRAWN	J.A.C. 3-21-89	CHECKED BY	S.T.H 12-6-89	DRAWING NUMBER	4096[illegible]7-A6
		APPROVED BY	[illegible] 12-6-89		



DWG. NOT TO SCALE

⊕ DRILLING LOCATION

FIGURE 4-12

SOIL BORING LOCATION MAP
UNDERGROUND STORAGE TANK
AT BUILDING #813

PREPARED FOR

HUNTER'S POINT ANNEX
SAN FRANCISCO, CALIFORNIA

INTERNATIONAL TECHNOLOGY CORPORATION

HP-813(*HP2)

5.0 CONCLUSIONS

Based on evidence collected by the soil gas surveys, laboratory analysis of soil samples, and field observations, it appears that all but one tank from the list in Table 3-1 has leaked. The one possible exception is Tank S-812 in the parking lot of Building 813. If it is assumed that the tanks are leaking or have leaked, then immediate removal or other interim actions (removal of tank contents) should be considered by WESTDIV.

Not all tank content samples were analyzed for chlorinated hydrocarbons because the presence of nearly pure product prohibited the laboratory from analyzing the sample using established protocol.

Interpretation of laboratory analysis suggests contaminant products are composed of gasoline, diesel, fuel oil, motor oil, and chemical solvents distributed over the different sites. A site by site interpretation of Tasks 3 and 4 results are included below. During the soil gas survey, the presence of chlorinated hydrocarbons was detected at every site in varying levels. This data indicates that there are sites separate from the underground tank sites that are acting as a source for the chlorinated hydrocarbons.

5.1 SITE SPECIFIC CONCLUSIONS

This section details site by site interpretation of Tasks 3 and 4 results.

5.1.1 Building 253 (Four 3,000 gallon; steel; gasoline USTs)

Building 253 is the site of four steel tanks (S-001, S-002, S-003, and S-004). The contents of all four tanks were identified by field observations as gasoline. Laboratory analysis results of 410,000 ppm of Total Petroleum Hydrocarbons (TPH) indicates a significant concentration of product.

Soil gas samples taken near the tanks revealed concentrations of benzene, toluene and xylenes (with four measurements in excess of 100 ppm). Gas chromatograph readings were noted by the operating chemist as resembling gasoline. (In addition, concentrations of TCA, DCE, DCA and TCE were found in the vicinity of the tank. The source of this contamination was not conclusively identified during this project.)

Based on the evidence of concentrations of compounds in the soil backfill similar to tank contents it is concluded one or more of these tanks have leaked.

5.1.2 Building 203

This site consists of three tanks (No. S-209, S-212, and S-213) scattered over a relatively wide area. During the investigation, each tank was considered separately.

5.1.2.1 Tank No. S-209 (210,000 gallon; concrete; fuel oil UST)

This tank is a large concrete structure. Laboratory analysis of the contents indicated 940,000 ppm TPH. Visual observations indicated the product is a heavy fuel oil.

Soil borings drilled near the tank revealed soil saturated with fuel oil and encountered extensive amounts of free product (fuel oil) floating on the ground water surface. Laboratory analysis of two soil samples taken from boreholes near this tank indicated TPH contamination of 120 ppm and 4 ppm.

Based on the field and laboratory evidence it is concluded that this tank has leaked.

5.1.2.2 Tank No. S-212 (4,500 gallon; steel; gasoline UST)

A sample taken of this tank's contents indicated 640,000 ppm of TPH. Field observations identified the product as gasoline.

Soil gas samples taken near the tank revealed contamination of benzene, toluene, and xylenes (BTX) in the backfill. These chemical compounds are commonly an indication of the presence of gasoline. (In addition, concentrations of TCA, DCE, DCA, and TCE were found in the vicinity of the tank. The source of this contamination was not conclusively identified during this project.)

Based on the evidence of compounds in the soil backfill similar to tank contents it is concluded that this tank has leaked.

5.1.2.3 Tank No. S-213 (35,000 gallon; concrete; treated water UST)
Laboratory analysis of the tank contents indicated low concentrations of methylene chloride (7 ppb), toluene (8 ppb), and xylenes (20 ppb). Visual observations of the tank contents suggests the product is predominately water. A thorough record search failed to determine the source of this water. A more thorough characterization of the contents should be performed prior to any transfer of the contents.

Soil samples taken near the tank did not reveal any hydrocarbon contamination above detection limits. No field observations suggesting contamination were noted.

It is IT's experience that older concrete tanks constructed in nonuniform backfill usually begin leaking due to differential settlement. Large cracks in the tank were noted on the exposed surfaces and may be an indication of cracks below the surface due to the inelastic properties of concrete. Therefore, it is concluded that this tank is leaking, but the low concentrations of contaminants in the contents were not above detection limits in the collected soil samples.

5.1.3 Building 205 (21,924 gallon; steel; fuel oil UST)
This site contains one steel tank (S-214) located at the end of a quay between dry docks 2 and 3. Tank contents were identified by field observation as fuel oil. A sample of the contents indicated 950,000 ppb TPH.

A soil sample collected from a borehole near the east end of the tank revealed 650 ppm TPH contamination. Extensive staining from product was noted in the soil backfill during drilling.

Based on the evidence of high concentrations of hydrocarbon contamination within the soil backfill of the tank, it is concluded that the tank has leaked.

5.1.4 Building 270 (25,320 gallon; steel; paint thinner UST)
A contents sample taken from the single steel tank (S-215) in this site revealed compounds common to many paint thinning solvents. The compounds

present included acetone (29 ppb), ethyl benzene (10 ppb) and xylenes (340 ppb).

Soil gas samples in the backfill near the tank revealed contamination of xylenes. In addition, concentrations of TCA and TCE were noted at one sample point. The source of this contamination was not conclusively identified during this project. Based on there being xylenes in both the tank and soil gas samples, it is concluded that this tank has leaked.

5.1.5 Building 251 (750 gallon; steel; solvent UST)
A sample taken from the single steel tank (S-251) found at this site indicated the contents to be a solvent agent. The compounds present included acetone (130 ppb) and xylenes (2300 ppb).

Soil gas samples in the backfill near the tank revealed contamination of xylenes. (In addition, concentrations of DCE, DCA, TCA, and TCE were found in the vicinity of the tank. The source of this contamination was not conclusively identified during this project.)Based on there being xylenes in both the tank and soil gas samples, it is concluded that this tank has leaked.

5.1.6 Building 304 (Two 6,880 gallon; steel; gasoline USTs)
Building 304 is the site of two steel tanks (S-304 and S-305). The contents of both tanks was identified by field observation as gasoline. Laboratory analysis of the contents indicated 66 ppm TPH.

Soil gas samples taken near the tanks revealed high concentrations of benzene, toluene and xylenes. Gas chromatograph readings were noted by the operating chemist to resemble gasoline. (In addition, concentrations of DCE, DCA, TCA and TCE were found in the vicinity of the tank. The source of this contamination was not conclusively identified during this project.)

Based on the evidence of high concentrations of compounds in the soil backfill similar to tank contents it is concluded that the tank group has leaked.

5.1.7 Building 435 (Two 750 gallon; steel; mixed solvent USTs)
Building 435 is the site of two steel tanks [S-435(1) and S-435(2)]. Laboratory analysis of the contents of each tank revealed a mixture of low concentrations (3.5 ppm) TPH and solvent compounds. These results indicate that a mixture of products have been stored in the tanks at different times. The contents of each tank included benzene, toluene, ethyl benzene, and xylenes.

Soil gas samples taken near the tank revealed contamination of benzene, toluene and xylenes. (In adition, concentrations of DCE, DCA, TCA, and TCE were found in the vicinity of the tank. The source of this contamination was not conclusively identified during this project.) Based on this evidence of similar compounds both in the tank contents and within the soil backfill it is concluded that this tank group has leaked.

5.1.8 Building 500 (750 gallon; steel; fuel oil UST)
Laboratory analyses of the contents sample taken from the single steel tank (S-508) at this site indicated the contents to be high boiling fuel hydrocarbons (46,000 ppm).

A soil sample collected from a borehole near the tank revealed hydrocarbon contamination at 90 ppm concentration.

Based on the evidence of hydrocarbon contamination in soil backfill near the tank it is concluded that this tank has leaked.

5.1.9 Building 709 (Four 5,000 gallon; steel; gasoline/diesel and one 500 gallon; steel; waste oil USTs)
This site contains five tanks (S-711, S-712, S-713, S-714, and S-715). Four of the tanks are located in one area with the fifth tank approximately 50 feet to the west. Field observations identified the contents of three tanks in the tank group as gasoline and one as diesel product. Laboratory analysis results indicated 400,000 ppm TPH (for the three gasoline tanks) and 560,000 ppm TPH (for the single diesel tank). The fifth tank appears to be a waste oil tank. Laboratory analysis of the contents from the single tank indicated compounds of methylene chloride (1500 ppb), acetone (1800 ppb), benzene (700 ppb), and toluene (2100 ppb).

Soil gas samples taken in the backfill around the tank group revealed concentrations of benzene, toluene and xylenes (with five measurements of species in excess of 100 ppm). Five of the chromatograph readings were noted by the operating chemist as resembling gasoline. Soil gas samples taken in the backfill of the single tank revealed contamination of xylenes and toluene. (In addition, concentrations of DCE, DCA, TCA, and TCE were found in the vicinity of the tank. The source of this contamination was not conclusively identified during this project.)

Based on the evidence of compounds present in the soil backfill similar to tank contents, it is concluded that both the tank group and the single tank have leaked.

5.1.10 Building 810 (One 10,800 gallon; steel; diesel and one 6,880 gallon; steel; freshwater/diesel USTs)

Building 810 is the site of two steel tanks (S-801 and S-802). Contents of both tanks was identified by field observations as diesel. Laboratory analysis of the contents indicated 860,000 ppm TPH in Tank S-802 and over 950,000 ppm TPH in Tank S-801.

One soil sample collected near to the tanks revealed contamination of 160 ppm TPH. Laboratory gas chromatograph readings were noted as being similar to a Diesel No. 2 calibration standard. In addition, petroleum odors were noted in the soil cuttings during drilling operations.

Based on the evidence of laboratory and field data, it is concluded that this tank group has leaked.

5.1.11 Building 813 (10,000 gallon; steel; fuel oil UST)

Laboratory analysis of the contents taken from the single steel tank (S-812) at this site indicated the contents to be 760,000 ppm TPH. Field observations made during sampling identified the contents as diesel product.

Two soil borings drilled in the backfill around the tank gave no visual indication of escaped product. Laboratory analysis of a soil sample collected in

the backfill did not indicate any hydrocarbon contamination above detection limits.

Based on laboratory analysis and field observations, no evidence of tank leakage was detected.

6.0 RECOMMENDATIONS FOR CHARACTERIZATION OF LEAKING TANKS (TASK 6)

6.1 PURPOSE AND OBJECTIVES

The purpose of Task 6 is to define the local ground water gradient and determine the vertical and horizontal extent of contamination in the ground water for each tank or tank group. The recommended activities detailed below represent the minimum quantity of soil borings, monitoring wells, samples, etc., specified in the Work Plan and RWQCB regulations. Further activities may be required by the local lead agency or if contamination proves extensive at any particular site (i.e., contaminants have migrated beyond the tank excavation and adjacent soils).

Data collected by implementing these recommendations will be presented in a subsequent technical report (Site Characterization) as part of the same task. The report will include site specific recommendations and designs for the removal of all leaking tanks and remediation of contaminated soils and ground water associated with the tanks.

6.2 GENERAL RECOMMENDATIONS AND RATIONALE

The activities planned to characterize the leaking tank sites are based on the following:

- Project Plan for Underground Tank Investigation, Naval Station Treasure Island, Hunters Point Annex (IT, September 16, 1988)
- Regional Water Quality Control Board Staff Recommendations for Initial Evaluation and Investigation of Underground Tanks (RWQCB Staffs of Regions 1, 2 and 3, June 2, 1988)
- City and County of San Francisco Underground Storage Tank Regulations.

These documents provide the methodology and rationale of procedures to be followed during each activity.

Each of the identified tanks or tank groups will be investigated on a site specific basis. Characterization of each site will involve a combination of the following activities:

- Soil Gas Surveys - A series of supplemental soil gas sampling points will be placed around those tanks and tank groups determined to be leaking volatile organic compounds. The purpose of these additional sampling points is to estimate the gross extent of the contamination plume resulting from the tank leaks. The soil gas points will be placed in a radial pattern extending out from the tank before any soil sampling or monitoring well construction takes place. Samples will be analyzed with a portable gas chromatograph in the field to allow on-site interpretation and any necessary modifications of preplanned sampling locations.

- Soil Sampling - Additional soil samples will be taken using a hollow stem auger drill rig to further define the contamination plume both horizontally and vertically. Soil borings will be drilled around all leaking tanks. Some of the borings will extend to depths below the ground water table to allow for sampling of ground water after the borings are converted to monitoring wells. Each boring will be visually logged and soil samples will be recovered on five-foot intervals to depth of ground water. The drilling methods are outlined in Section 4.3 of the Sampling and Analysis Plan (Work Plan Volume II). Details of soil sample collection and handling procedures are presented in Section 4.6 of the same volume. All borings not converted to monitoring wells will be backfilled with a 95 percent portland cement/5 percent bentonite grout. Soil samples will be analyzed for semi-volatile petroleum hydrocarbons (modified EPA Method 8015) and volatile organic compounds (EPA Method 8240) at a minimum.

- Monitoring Wells - To provide for ground water sampling, some of the soil borings will be converted to monitoring wells. The locations of monitoring wells are based on the results of previous soil gas surveys and subsurface sample analyses. The location and depth of the borings will satisfy the RWQCB guidelines concerning proximity to the source of leaks and will define the local water table gradient. Three monitoring wells will be installed at single or paired tank locations, and four monitoring wells will be installed at tank clusters. For sites with more than three wells, only three will be placed initially. The water will be allowed to equilibrate and a site relative elevation made to determine ground water flow direction. The remaining wells will then be placed in the downgradient direction. Planned locations of wells are included with site specific recommendations in following sections.

  Ground water from each monitoring well will be sampled only once during this investigation. However, the monitoring wells will be constructed according to standard procedures (Section 4.5 of the Work Plan) and will be left in place to allow for continued sampling should the Navy in consultation with the regulatory agencies elect to collect more samples.

  Because of the probable saline condition of the ground water, the wells will be constructed of 4-inch-internal diameter Schedule 40 PVC, flush joint threaded casing. In accordance with Staff Recommendations for Initial Evaluation and Investigation of Underground Tanks

established by the Regional Water Quality Control Board (RWQCB), San Francisco Bay Region, the monitoring well borings will be drilled to a depth of 20 feet into the uppermost permeable sediments or 5 feet into bay mud, an organic-rich clay that is expected within 15 feet of the ground surface over much of the Annex. The monitoring wells will be screened from approximately 2.5 feet above the highest expected water table elevation to 2.5 feet below the lowest water table elevations. However, monitoring well screen intervals should not exceed ten (10) feet unless prior approval is obtained from the DHS.

All wells will be developed 24 hours after installation. Development will be done by a combination of swabbing and pumping. Methods of development and documentation are included in Section 4.5.3 of the Sampling and Analysis Plan.

- Ground Water Sampling - Ground water sampling for this investigation will be limited to one round of sampling of newly installed monitoring wells. Each well will first be checked for floating free product. Sampling of floating free product will not commence until at least 24 hours after development of the well. If found, floating free product will be sampled and shipped to an IT laboratory for analysis. If floating free product is not present, or present in only minor amounts (layer less than 0.25 -inch thick), the ground water will be sampled and shipped to the laboratory for analysis of dissolved constituents.

  Sampling procedures are presented in Section 4.7 of the Work Plan.

6.3 SITE SPECIFIC RECOMMENDATIONS

The first action to be taken should be the immediate removal of all tank contents. Tank contents removal could be accomplished by pumping of liquid contents in each tank into a licensed and approved transport. The material then should be transported to an authorized disposal facility or to an approved recycling plant. Those tanks whose contents were not analyzed for volatile organic compounds (due to high product concentration) should have confirmatory contents tests in the field using colorimetric tubes. Compounds tested for will include: benzene, toluene, trichloroethane, trichloroethylene, and o-xylene.

The following subsections detail specific investigative steps for each site identified during Tasks 3 and 4. The locations of all soil gas sampling points, borings and monitoring well locations are presented in Figures 6-1 through 6-12 of this section. Although efforts to locate underground utilities have been made, exact locations of the sample positions may have to be

moved due to underground interference. Other field conditions (i.e., traffic, above ground structures, large boulders in backfill) may also cause sampling positions to be changed.

As part of the site characterization, site activities and operations of associated buildings will be determined and integrated into the Site Characterization Report.

6.3.1 Building 253 (Figure 6-1)

This site contains four steel tanks numbered S-001 through S-004. Contents of each tank have been identified as gasoline. Soil gas samples taken at the site indicate high concentrations of volatile organic contaminants (2,200 to 10,300 ppm) in the soil backfill.

An additional soil gas survey will be used to define the extent of contamination. Approximately 4 transect lines will be run with a total of 13 sampling points. The exact location and number of soil gas samples are to be determined in the field, based on results of the first few points of the survey.

Following the soil gas survey, soil borings will be placed in the area of the tank to confirm survey results. Six borings are anticipated with one soil sample selected from each for chemical analysis. Four of the borings will be converted to monitoring wells, positioned around the tank to define local gradient and contamination effects on ground water.

Proposed soil gas sampling points, soil borings, and monitoring well locations are shown on Figure 6-1.

6.3.2 Building 203 (Figure 6-2)

In the vicinity of Building 203 are three tanks, positioned over a relatively wide area. Each tank is unique in construction and contents. It is therefore recommended that each tank be treated separately, rather than treating all three as a cluster. The three tank locations in relation to each other are shown in Figure 6-2.

6.3.2.1 Tank No. S-209 (Figure 6-3A)

Tank No. S-209 is a 210,000-gallon steel reinforced concrete bunker located under a parking lot south of Building 203. Exploratory borings near the tank encountered extensive amounts of free product (fuel oil) floating on the ground water surface.

Additional soil borings will be placed in the area of the tank to define the extent of soil contamination and direction of migration. Eight borings are anticipated with one soil sample selected from each for chemical analysis. Three of the borings will be converted to monitoring wells, positioned around the tank to define local gradient and contamination effects on ground water. Sampling locations are shown as Figure 6-3A.

6.3.2.2 Tank No. S-212 (Figure 6-3B)

Adjacent to the south side of Building 203 is tank S-212. This tank is of steel construction and 3,000- to 4,500-gallon capacity. Information from WESTDIV suggested two tanks were in this area and that the tanks contained fuel oil. At this time only one tank has been located and sampling of the contents indicates the product is gasoline. Soil gas sampling revealed contamination in the backfill around the tank of toluene (8 ppb) and xylene (20 ppb).

Access to this tank is very limited, and complicated by many other underground structures. Additional soil gas sampling (eight points) will be done to define the extent of contamination.

Following these tests three soil borings, positioned near the tank, are recommended with one sample selected from each for chemical analysis. The three soil borings will be converted to monitoring wells, which will be used to define local gradient and contamination effects on ground water. Sampling locations are shown as Figure 6-3B.

6.3.2.3 Tank No. S-213 (Figure 6-3C)

Tank No. S-213 is a 35,000-gallon steel reinforced concrete bunker used to store "treated water." The tank lies almost completely under a raised

concrete pad located near the intersection of Nimitz Avenue and Blandy Street. Laboratory analysis of the tank contents revealed levels of toluene (8 ppb) and methylene chloride (7 ppb). A soil sample taken from two borings near the tank did not indicate any contamination above detection limits and no observations of contamination were noted during drilling.

It is anticipated that borings/monitoring wells installed at this site will show little, if any, contamination from the tank. It is IT's experience that older concrete tanks constructed in nonuniform backfill usually begin leaking due to differential settlement. For this reason, it is recommended that the tank be treated as leaking, whether or not significant contamination is detected.

Three monitoring wells are recommended to establish ground water gradient, procure confirmatory soil samples for laboratory analysis (one from each boring), and allow ground water sampling. Sampling locations are shown on Figure 6-3C.

6.3.3 Building 205 (Figure 6-4)

This site contains one steel tank of 21,924 gallons capacity. The tank is located at the end of a quay between Dry Docks Nos. 2 and 3. The contents of the tank is fuel oil. Field observations during sampling and laboratory analysis indicate heavy contamination in the backfill between the tank and a nearby seawall. Access to the tank with equipment is extremely limited by buildings, concrete underlying asphalt (which may cover underground utilities), and an old wooden dock attached to the seawall at this location.

Three additional soil borings will be placed in the area of the tank to define the extent of soil contamination and direction of migration. One soil sample will be selected from each boring for chemical analysis. The borings will be converted to monitoring wells to define local gradient and contamination effects on ground water. Proposed drilling locations are shown on Figure 6-4.

6.3.4 Building 270 (Figure 6-5)

Tank No. S-215 is located in a concrete-paved access lane between Building 270 and the Building 270 annex. The tank is of steel construction with a 25,320-gallon capacity and contains a solvent used for paint thinning. Soil gas

samples taken in the vicinity of the tank indicated detectable levels of TCE; a compound used in many chemical solvents.

Additional soil gas tests (14 sample points) should be done to define the lateral extent of contamination. Following these tests, three soil borings will be drilled to obtain analytical samples. One soil sample will be selected from each boring to confirm soil gas results. After drilling and sampling, the three borings will be converted to monitoring wells. The wells should be screened from the anticipated bay mud contact (a relatively impermeable strata approximately 15 feet below the ground surface), to at least 2.5 feet above the encountered ground water table (with the total screened interval limited to no more than 10 feet in length without prior DHS approval). The wells will provide data on local gradient and ground water samples which will be analyzed for dissolved contaminants. Locations of proposed soil gas sample points and monitoring wells are shown on Figure 6-5.

6.3.5 Building 251 (Figure 6-6)

This site is located near the north wall of Building 251. Earlier information suggested there were two tanks of unknown contents in the vicinity. At this time only one tank has been found. The tank appears to be of approximately 750 gallons capacity and steel construction. Analysis of a sample of the contents indicates a solvent product, probably a type of paint thinning agent. Soil gas samples taken from the soil around the tank revealed volatile organic contaminants.

Additional soil gas tests (seven points) should be done to define the lateral extent of contamination. Three soil borings will be drilled to obtain analytical samples. One soil sample will be selected from each boring to confirm soil gas results. After drilling and sampling, the three borings will be converted to monitoring wells. The wells should be screened from the anticipated bay mud contact (a relatively impermeable strata approximately 15 feet below the ground surface), to at least 2.5 feet above the encountered ground water table (with screened interval limited to no more than 10 feet without approval of DHS). The wells will provide data on local gradient and ground water samples which will be analyzed for dissolved product. Locations of proposed soil gas sample points and monitoring wells are shown on Figure 6-6.

Should a second tank be encountered during site characterization, additional soil gas tests and monitoring wells may be required. The number and location of additional borings will be determined.

6.3.6 Building 304 (Figure 6-7)

Building 304 is the site of an unused fuel station on Morrell Street near Dry Dock Number 4. Two tanks (S-304 and S-305) are located under an asphalt parking lot near the southeast corner of the building. Both tanks are of steel construction and 6,880 gallon capacity. Laboratory analysis of the contents indicates both tanks contain gasoline. Vadose zone samples revealed high concentrations (approximately 4,500 ppm) of volatile organic compounds in the soil around the tanks.

As the two tanks are positioned nearly adjacent to each other, it is recommended that soil and water investigations be conducted in the same manner as a single tank. Additional soil gas tests will be done in transect lines to define the extent of the contaminant plume. A total of 16 soil gas samples are anticipated. Following this effort, three borings will be completed to extract soil samples for confirmatory laboratory testing of the soil gas results. One soil sample will be selected from each boring for analysis. The borings will be converted to monitoring wells for hydraulic gradient definition and to allow ground water or free product sampling. Figure 6-7 shows proposed locations of soil gas sampling points and monitoring wells.

6.3.7 Building 435 (Figure 6-8)

This site has two tanks, S-435(1) and S-435(2). The site is currently leased as commercial cabinet and metal working shops. The tanks are only approximately located as abundant above ground metallic objects in the area caused extensive interference with the magnetometers used to survey the site. Both tanks are of steel construction and approximately 750-gallon capacity. The site has several concrete slabs that may cover the tanks and asphalt paving over the rest of the surface. The contents of the tanks appears to be a mixture of products, dominantly volatile organic compounds. Soil gas samples taken in the vicinity of the tanks contained 31 ppm TCE and other volatile organics.

To define the lateral extent of contamination approximately ten additional soil gas samples will be collected and analyzed in the field. The exact locations of soil gas points will be determined during the survey based on initial results and the presence of surface or subsurface obstructions. As both tanks appear to be of relatively small capacity and close together the two tanks will be treated as one source under RWQCB regulations. Three monitoring wells will be installed in order to define local hydraulic gradient and to provide sampling of ground water. During well installation, one soil sample will be selected from each boring for laboratory analysis. The analysis will serve as confirmation of soil gas sampling results. The wells will be screened from the first encountered semi-impermeable strata (anticipated to be bay mud at approximately 15- to 20-foot depths) to at least 2.5 feet above the encountered ground water table (with screened interval limited to no more than 10 feet without approval of DHS). This should be done to permit collection of possible contaminants with specific gravities either greater or less than 1.0. Locations of soil gas sampling points and monitoring well/soil sample locations are shown on Figure 6-8.

6.3.8 Building 500 (Figure 6-9)

Tank No. S-508 is a 750-gallon capacity vessel of steel construction located in a roughly paved asphalt lot on the east side of Building 500. Analysis of the tank contents and base records indicate the product as fuel oil. Soil samples collected during Task 4 drilling operations revealed 90 ppm of high boiling point hydrocarbon contamination in the soils near the tank.

Additional soil borings will be used to define the extent of vertical and lateral contamination around the tank. One or two soil samples will be selected from each boring for laboratory analysis. At least three soil borings will be done and more may be necessary should contamination prove to be extensive. After soil sampling, three of the borings will be converted to monitoring wells for ground water sampling and to define the local ground water gradient. Figure 6-9 shows proposed sample locations.

6.3.9 Building 709 (Figure 6-10)

Building No. 709 is a former retail fuel station, which is no longer in use, located at the intersection of Manseu and I Streets. There are five tanks on the site. Four of the tanks are clustered under a concrete apron near the fuel pump islands. These tanks are Nos. S-711 through S-714 and each is made of steel with 5,000-gallon capacity. Sampling of the contents indicates that three of the tanks contain gasoline and one (S-714) contains diesel product. Soil gas samples taken near these tanks reveal high concentrations (up to 1,432 ppm) of volatile organic compounds. The fifth tank (S-715) was discovered during the tank location survey (Task 3) near the southwest corner of the building. This tank is a 500 gallon steel vessel which currently contains mixed waste oil product. Two soil gas samples collected near this tank revealed volatile organic vapor contamination in the vadose zone.

To define the lateral extent of contamination 17 additional soil gas samples will be collected. The sample points will be positioned during field work to take into account initial results and any obstructions encountered. To confirm the soil gas results and to provide analytical samples of potential nonvolatile contaminants, a series of soil borings will be drilled. A total of six borings are anticipated with one soil sample selected from each to be analyzed in the laboratory. To define the local ground water gradient and to provide water samples, five of the soil borings will be converted to monitoring wells. Four of the wells will be used to define the gradient of the tank cluster. One of these four wells and an additional well will provide similar data for the 500-gallon tank nearby. Locations of the monitoring wells and proposed soil gas sampling locations are shown on Figure 6-10.

6.3.10 Building 810 (Figure 6-11)

This site was formerly a fuel station and contains two steel tanks, S-801 and S-802. The tanks have capacities of 10,800 and 6,880 gallons respectively, and are very close together. The site is within a fenced enclosure near Building 810 which is currently designated as the base hazardous materials storage area. Contents of the tanks are shown on base records to be diesel with fresh water. A soil sample taken at the site indicated hydrocarbon contamination of 160 ppm. The hydrocarbons were identified by the laboratory as similar to a gas chromatograph calibration standard of diesel No. 2.

Additional soil borings will be placed in the area of the tank to define the extent of soil contamination and direction of migration. Five borings are anticipated with one soil samples selected from each for chemical analysis. Following soil sampling three of the borings will be converted to monitoring wells. These wells will provide ground water gradient data and water samples for analysis of free or dissolved product. Figure 6-11 shows proposed locations of monitoring wells and soil borings.

6.3.11 Building 813 (Figure 6-12)

Tank No. S-812 is a 10,000-gallon steel vessel located under the asphalt paved parking lot on the east side of Building 813. The building is currently in use as offices for SUPSHIP. Sampling of the current tank contents indicates a fuel oil product. The tank is surrounded by six sacrificial anodes used to provide cathodic protection for the vessel. An initial investigation under Task 4 showed no evidence of soil or ground water contamination. It is anticipated that little or no environmental contamination will be associated with this tank. Additional work should be limited to two more soil borings around the tank with one soil sample collected from each boring. These borings will be used to confirm the initial findings. Figure 6-12 shows the location of the tank and the two proposed borings.

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		APPROVED BY	JF 11-29-89		

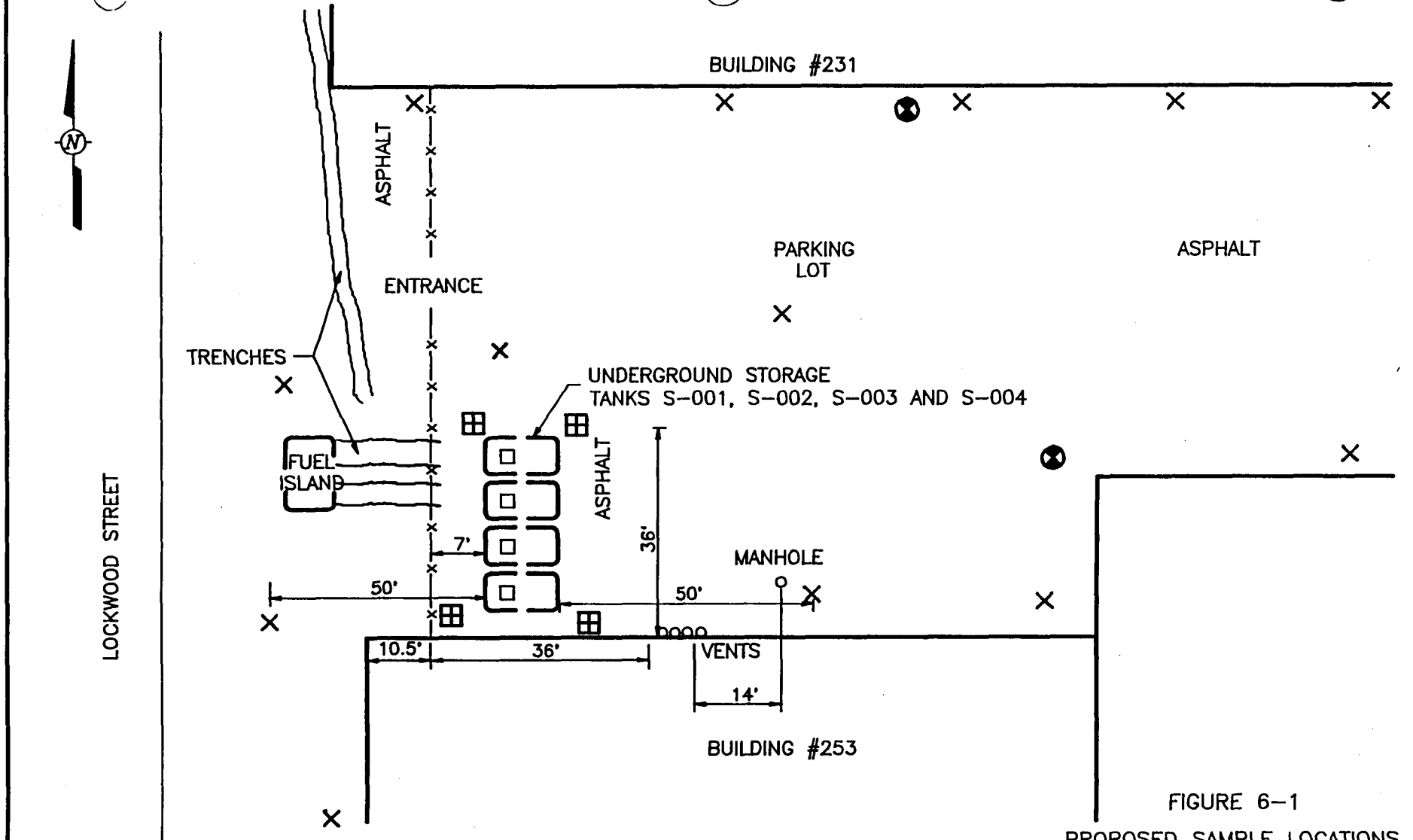

FIGURE 6-1

PROPOSED SAMPLE LOCATIONS
UNDERGROUND STORAGE TANKS
AT BUILDING #253

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

LEGEND:

- X SOIL GAS SAMPLE
- ⊞ BORING/MONITORING WELL
- ⊗ SOIL BORING

DWG. NOT TO SCALE

INTERNATIONAL TECHNOLOGY CORPORATION

HP253(*HP3)

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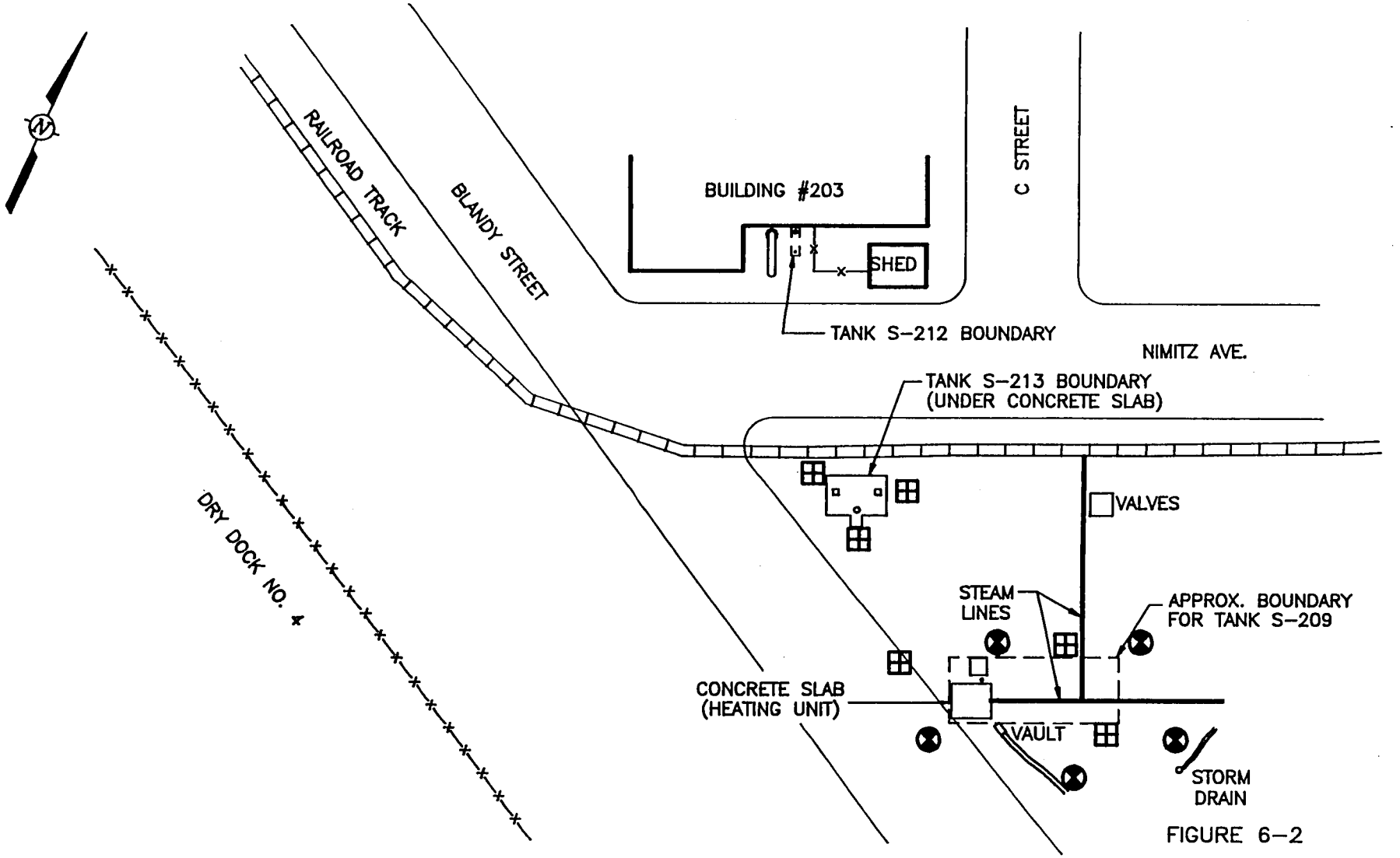

FIGURE 6-2

PROPOSED SAMPLE LOCATIONS
UNDERGROUND STORAGE TANKS
AT BUILDING #203

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

DWG. NOT TO SCALE

LEGEND:

- BORING/MONITORING WELL
- SOIL BORING

INTERNATIONAL TECHNOLOGY CORPORATION

HP203A(*HP2)

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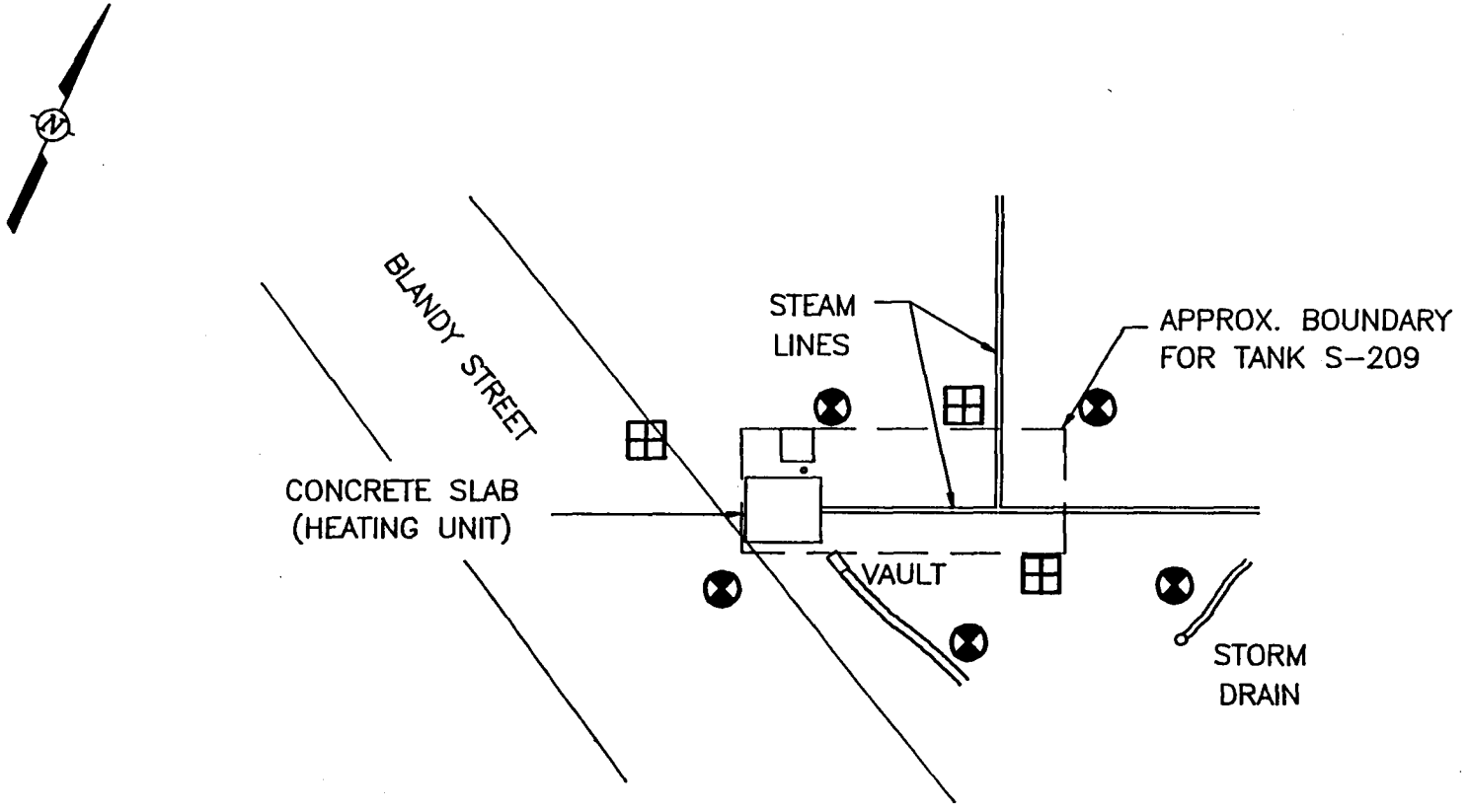

LEGEND:

- BORING/MONITORING WELL
- SOIL BORING

DWG. NOT TO SCALE

FIGURE 6-3A

PROPOSED SAMPLE LOCATIONS
UNDERGROUND STORAGE TANKS
AT BUILDING #203

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

INTERNATIONAL TECHNOLOGY CORPORATION

HP203CD(*HP3)

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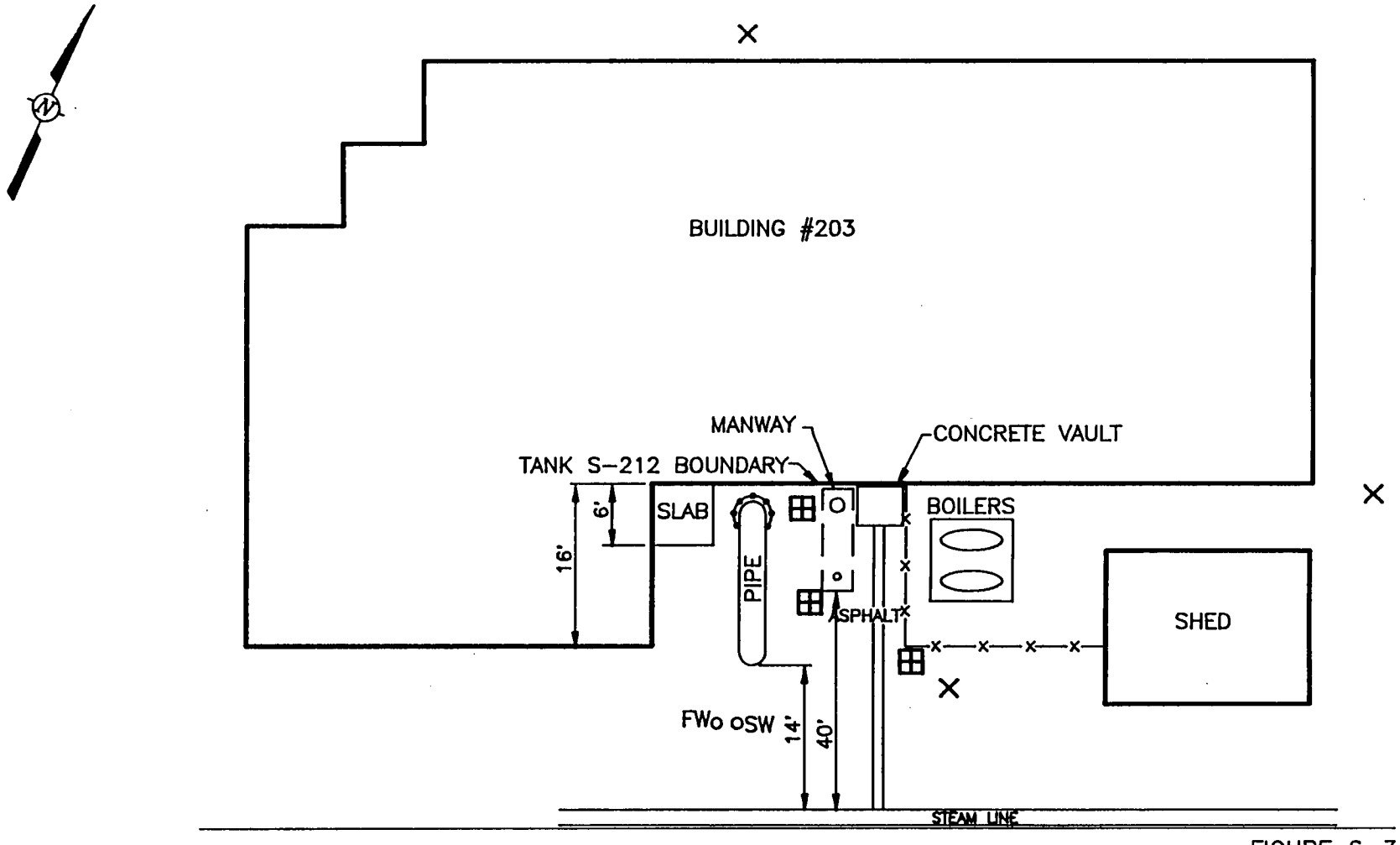

DWG. NOT TO SCALE

LEGEND:

- SOIL GAS SAMPLE
- BORING/MONITORING WELL
- SOIL BORING

FIGURE 6-3 B

PROPOSED SAMPLE LOCATIONS
UNDERGROUND STORAGE TANK
AT BUILDING #203

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

INTERNATIONAL TECHNOLOGY CORPORATION

HP203E(*HP3)

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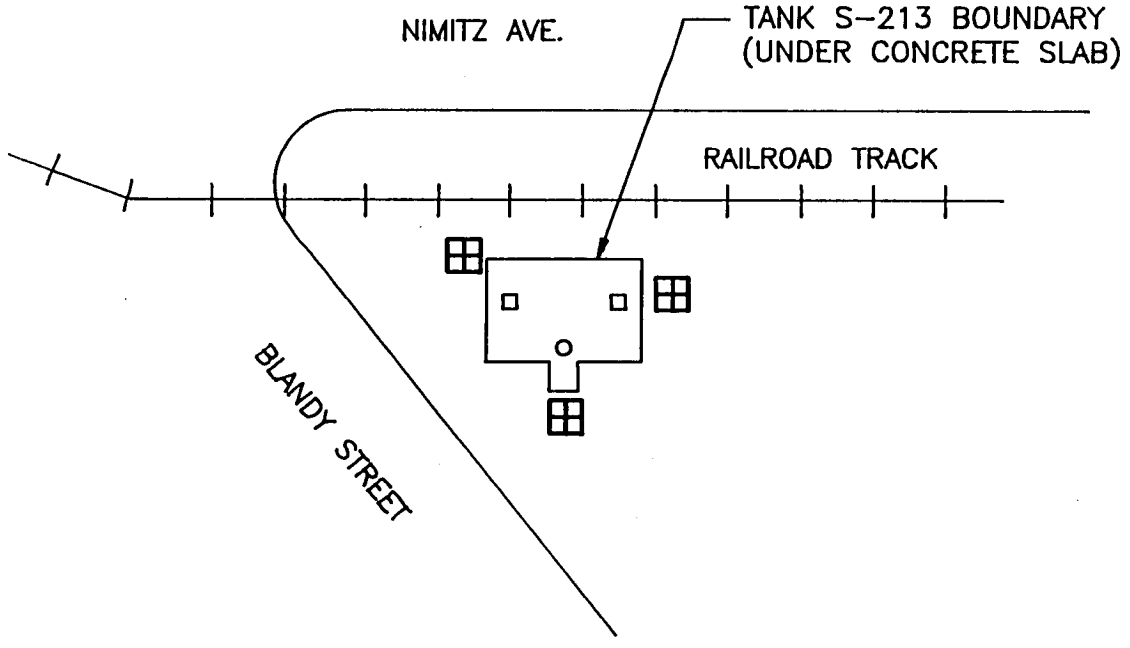

LEGEND:

⊞ BORING/MONITORING WELL

DWG. NOT TO SCALE

FIGURE 6-3C

PROPOSED SAMPLE LOCATIONS
UNDERGROUND STORAGE TANKS
AT BUILDING #203

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

INTERNATIONAL TECHNOLOGY CORPORATION

HP203AC(*HP1)

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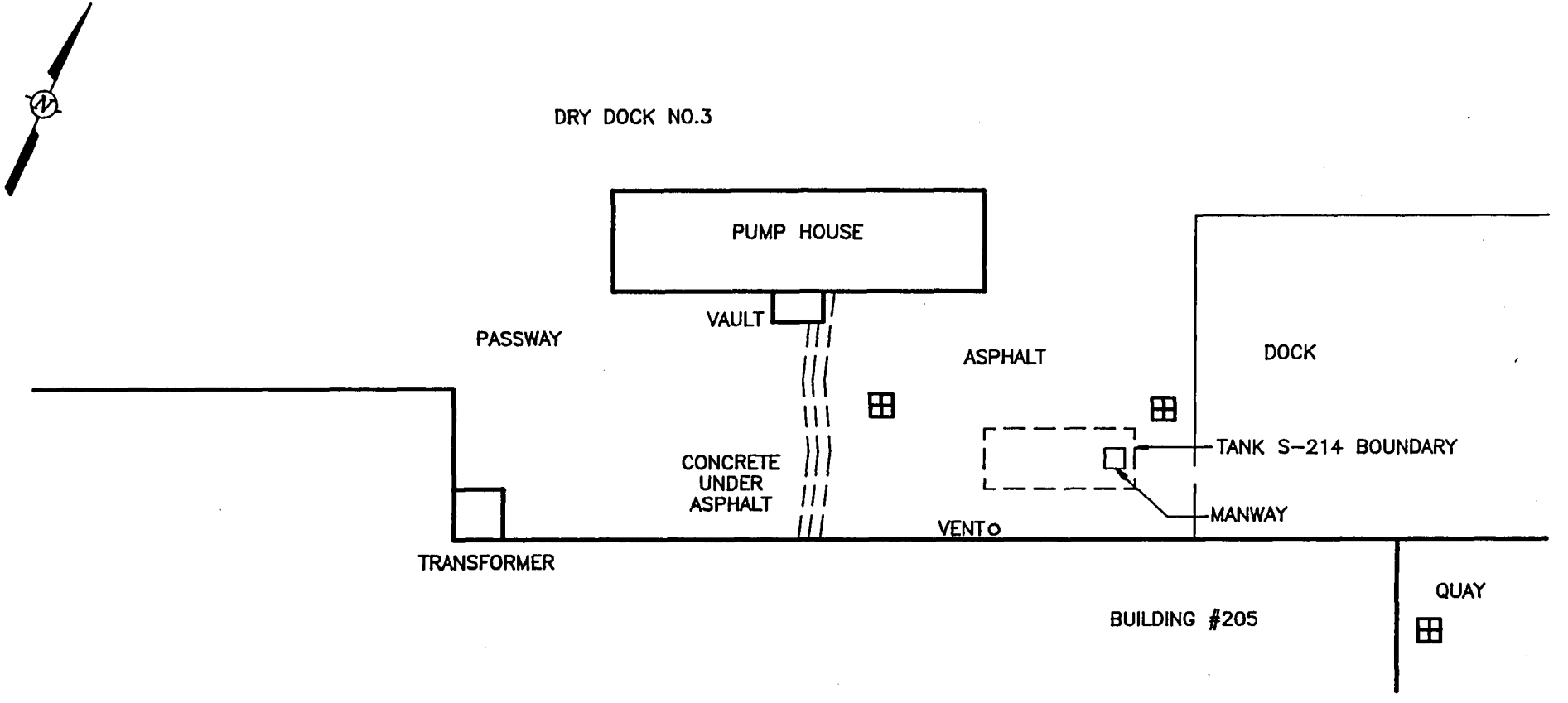

FIGURE 6-4

PROPOSED SAMPLE LOCATIONS
UNDERGROUND STORAGE TANK
AT BUILDING #205

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

LEGEND:

⊞ BORING/MONITORING WELL

DWG. NOT TO SCALE

INTERNATIONAL TECHNOLOGY CORPORATION

HP205(*HP3)

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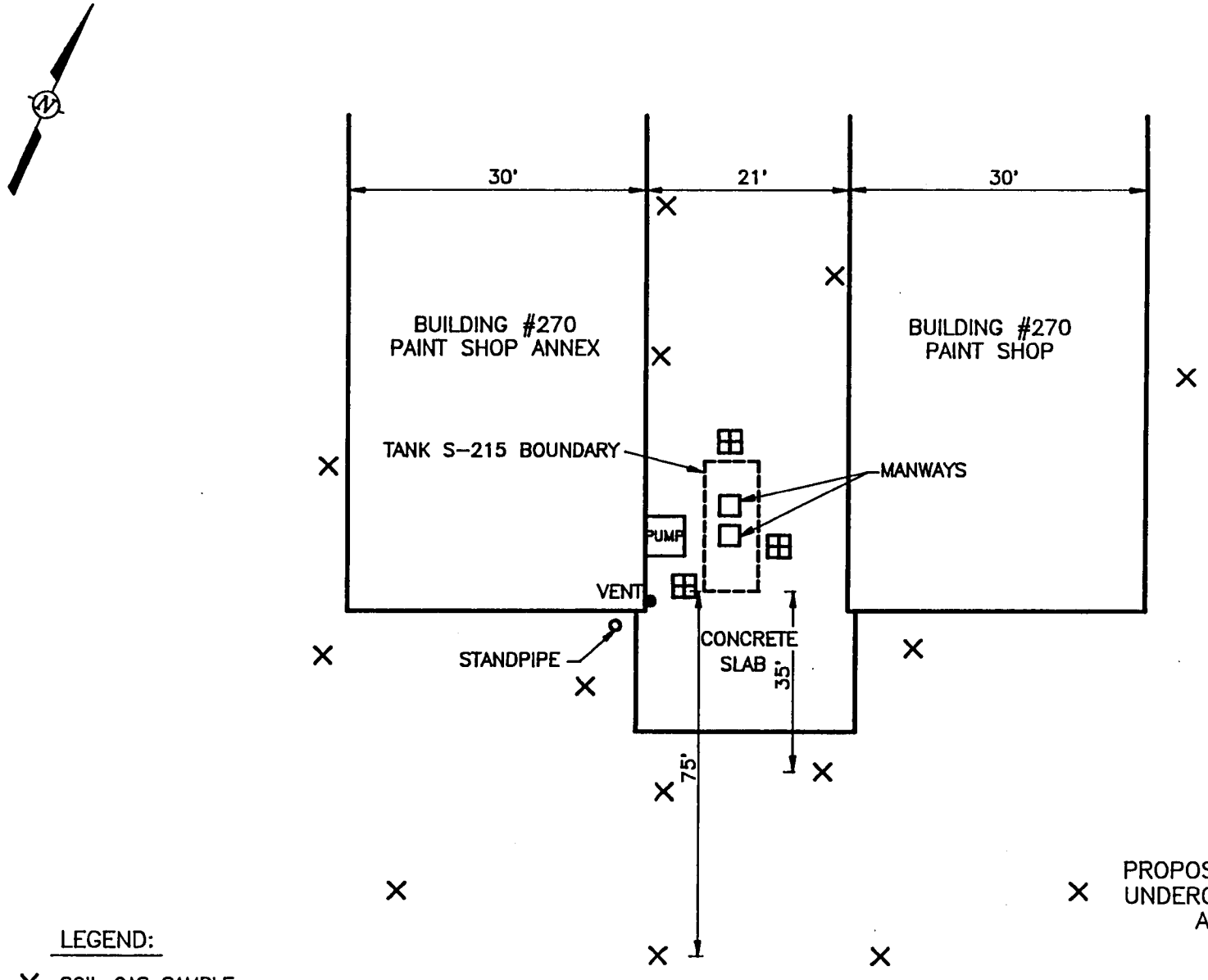

FIGURE 6-5

PROPOSED SAMPLE LOCATIONS
UNDERGROUND STORAGE TANK
AT BUILDING #270

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

LEGEND:

× SOIL GAS SAMPLE

⊞ BORING/MONITORING WELL

DWG. NOT TO SCALE

INTERNATIONAL TECHNOLOGY CORPORATION

HP270(*HP1)

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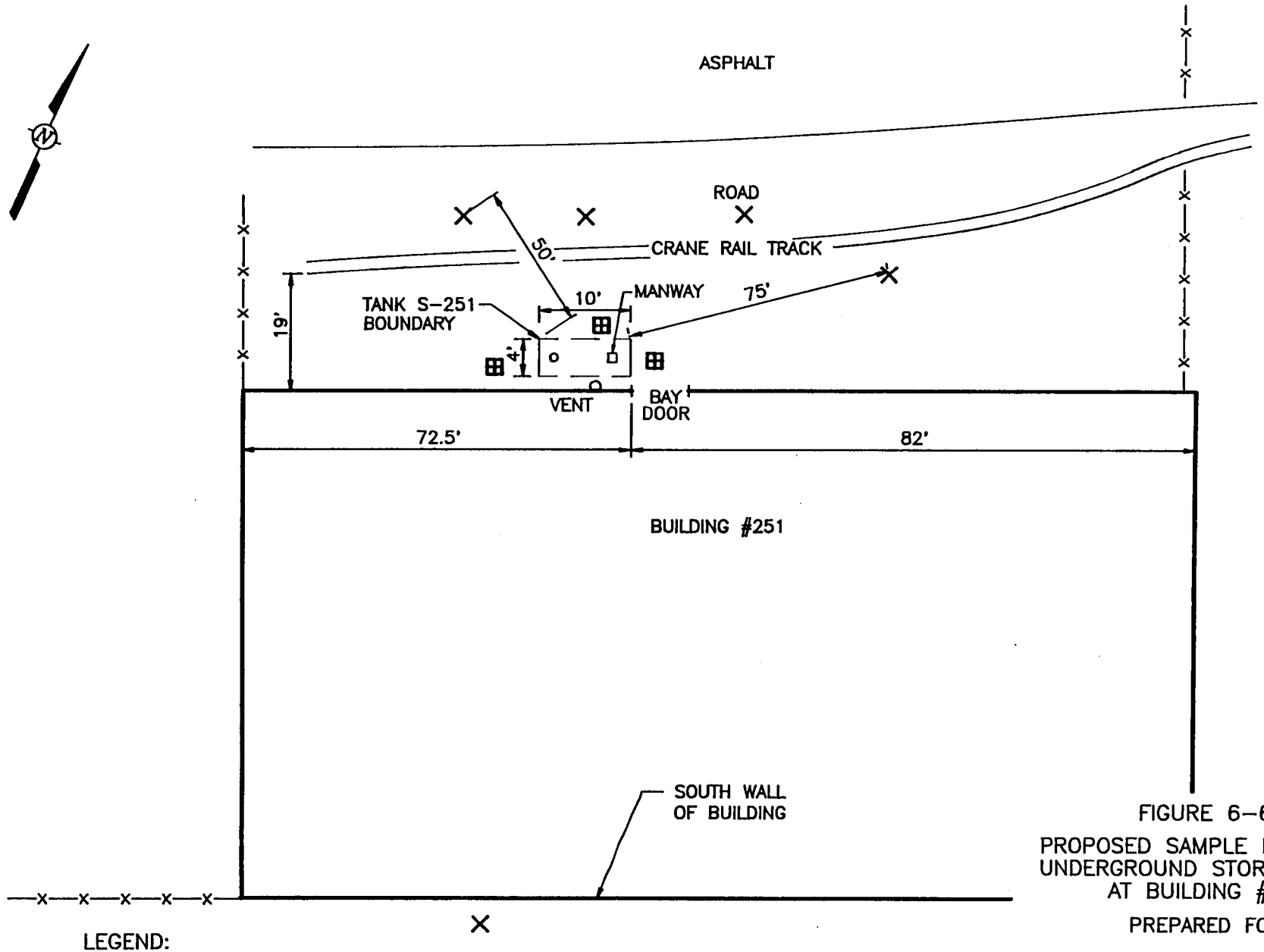

DWG. NOT TO SCALE

FIGURE 6-6

PROPOSED SAMPLE LOCATIONS
UNDERGROUND STORAGE TANK
AT BUILDING #251

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

INTERNATIONAL
TECHNOLOGY
CORPORATION

HP251(*HP1)

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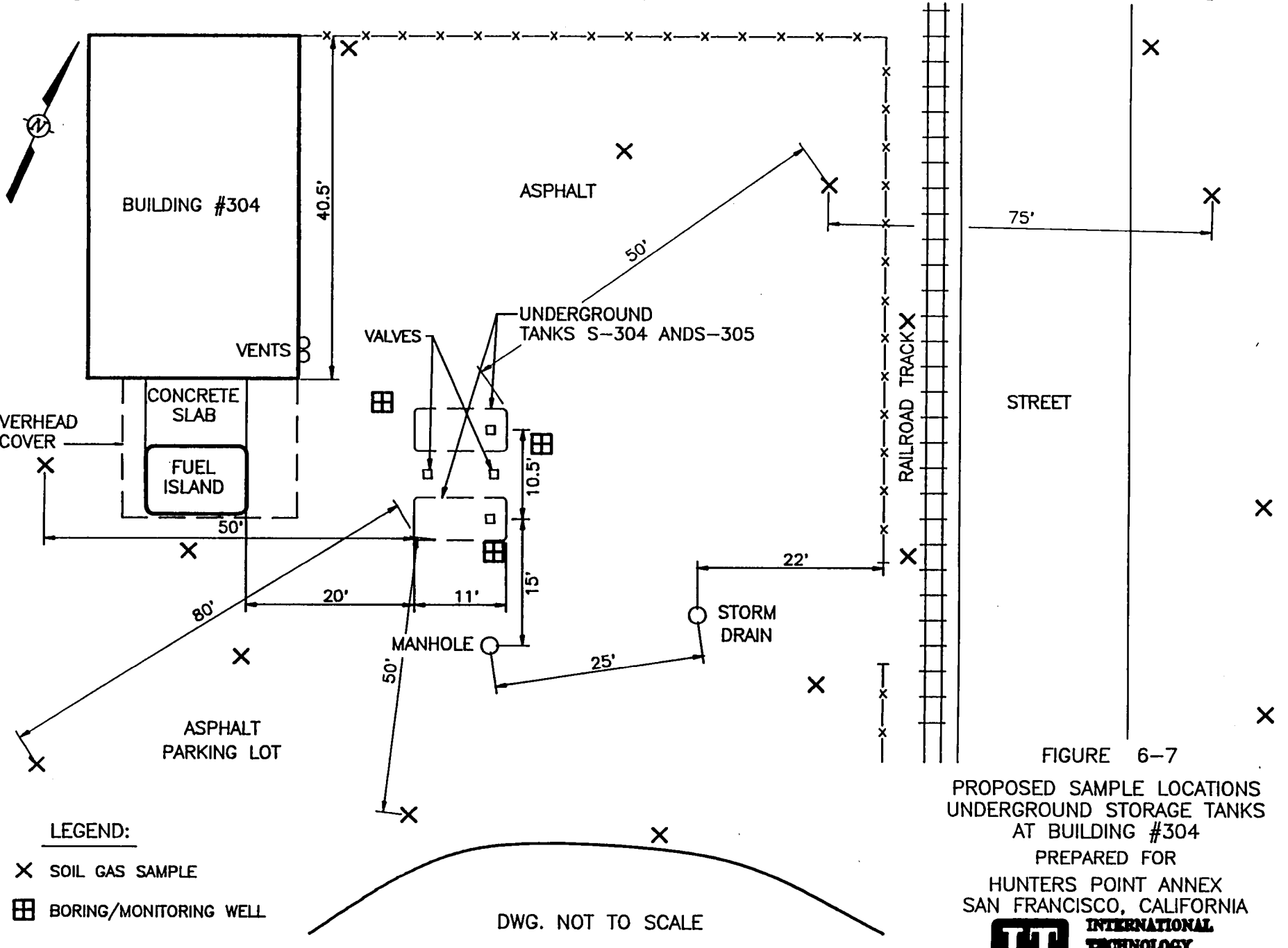

FIGURE 6-7

PROPOSED SAMPLE LOCATIONS
UNDERGROUND STORAGE TANKS
AT BUILDING #304

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

INTERNATIONAL TECHNOLOGY CORPORATION

HP304(*HP3)

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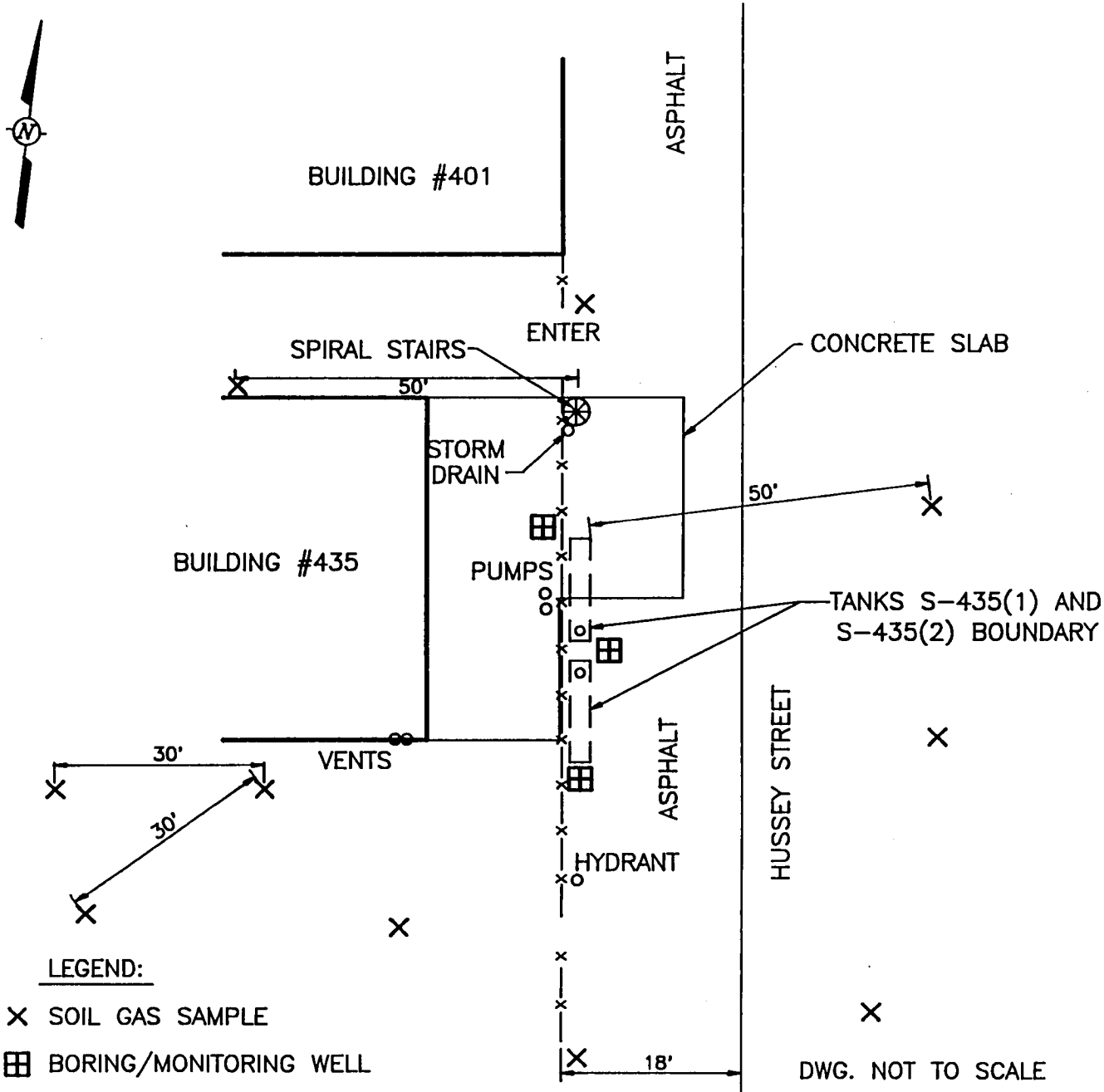

FIGURE 6-8

PROPOSED SAMPLE LOCATIONS
UNDERGROUND STORAGE TANKS
AT BUILDING #435

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

INTERNATIONAL TECHNOLOGY CORPORATION

HP435(*HP3)

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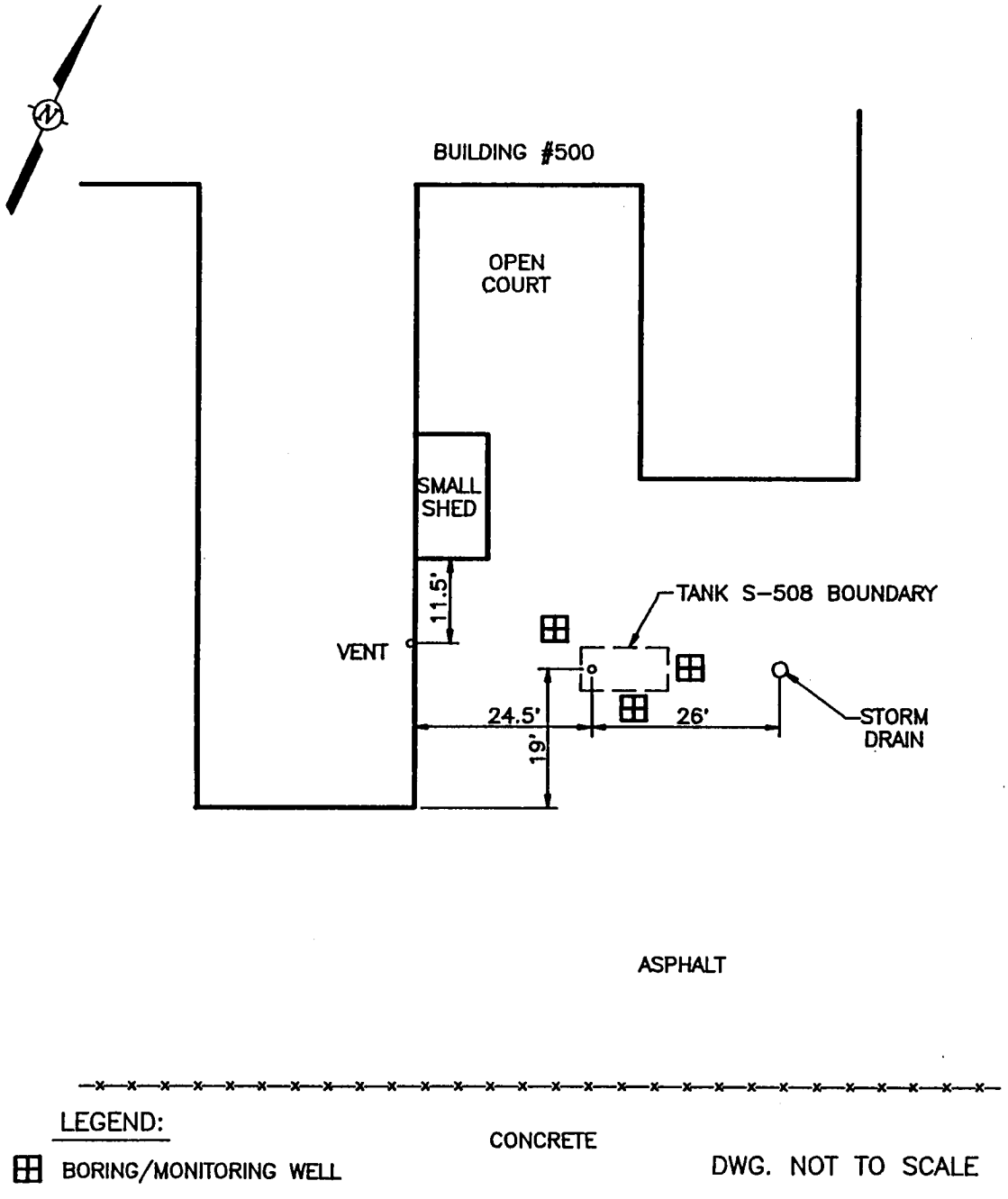

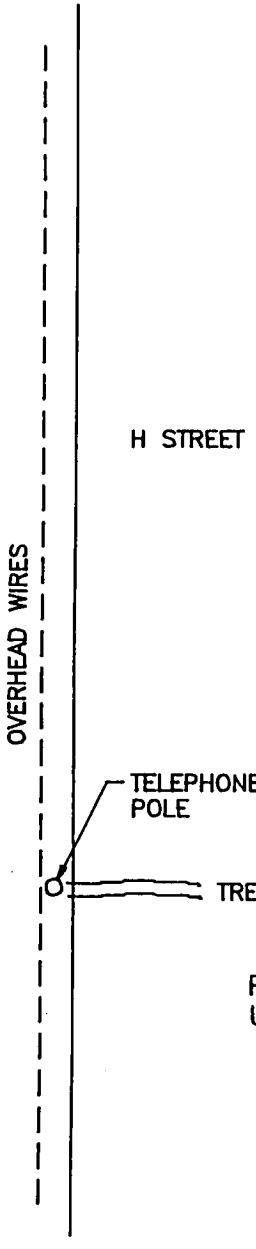

FIGURE 6-9

PROPOSED SAMPLE LOCATIONS
UNDERGROUND STORAGE TANK
AT BUILDING #500

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

INTERNATIONAL TECHNOLOGY CORPORATION

6-22

HP500(*HP3)

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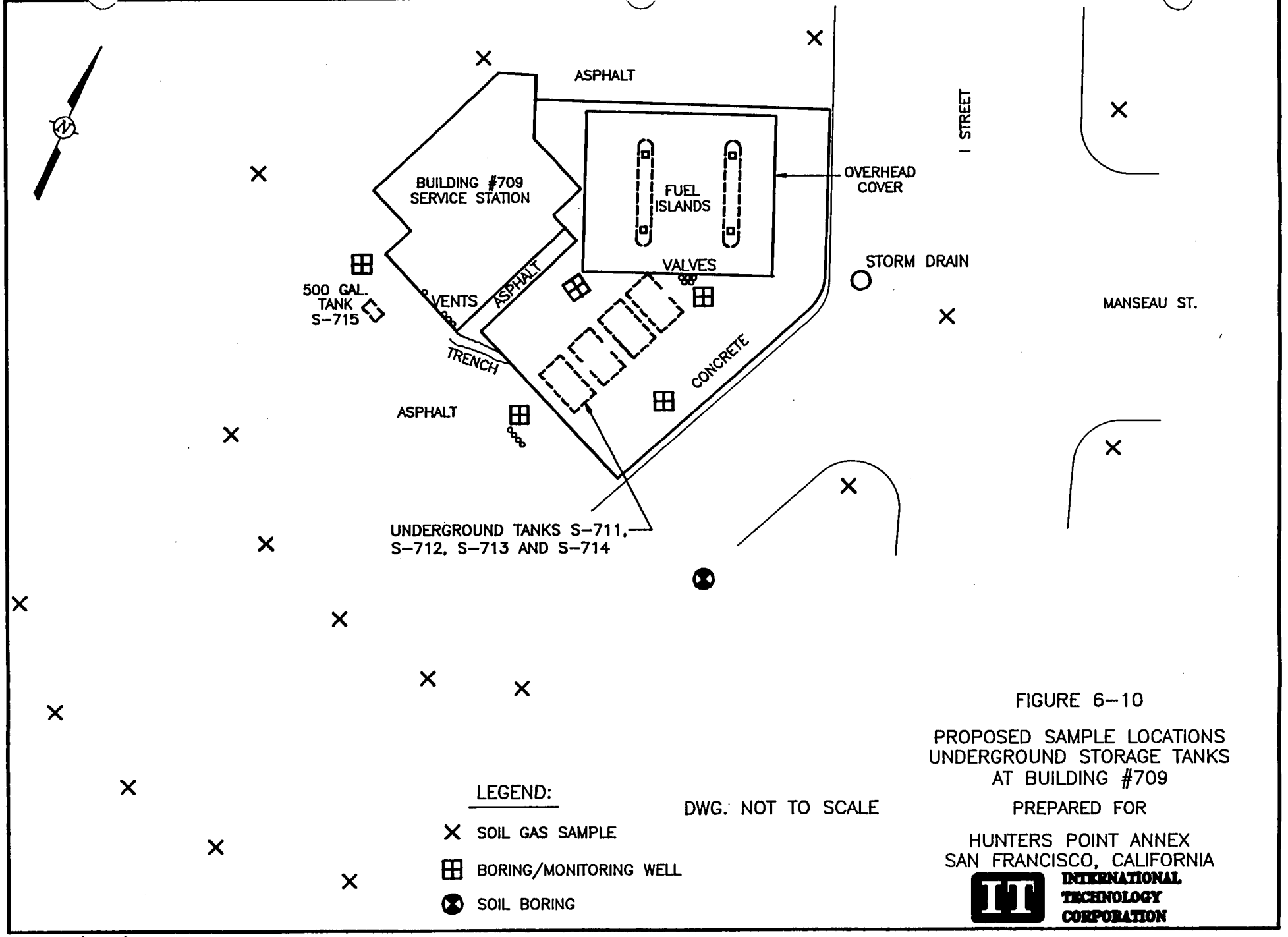

FIGURE 6-10

PROPOSED SAMPLE LOCATIONS
UNDERGROUND STORAGE TANKS
AT BUILDING #709

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

INTERNATIONAL TECHNOLOGY CORPORATION

HP709(*HP1)

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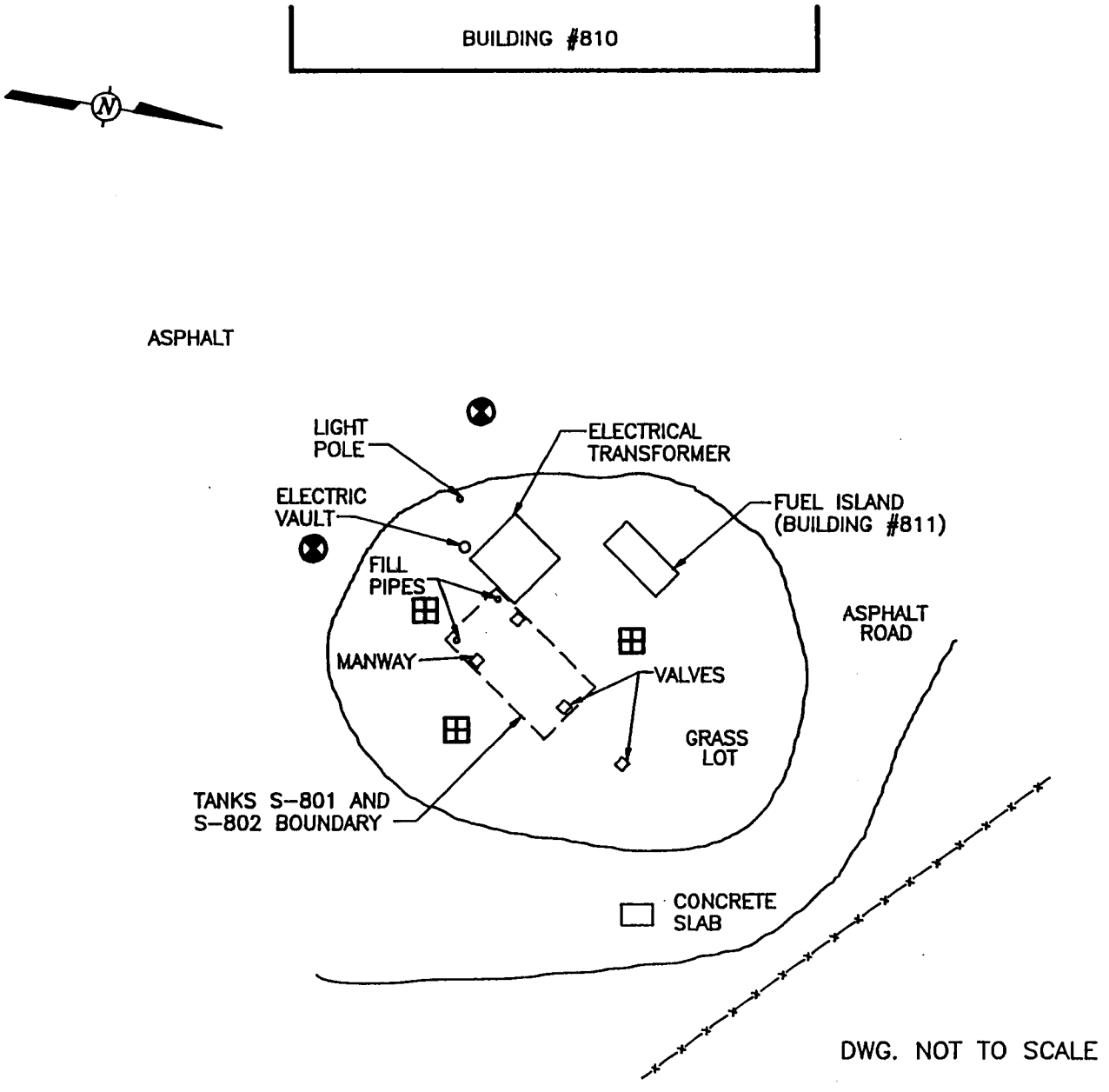

NOTE:

HUNTERS POINT–
HAZARDOUS MATERIALS
STORAGE AREA

LEGEND:

⊞ BORING/MONITORING WELL

⊗ SOIL BORING

FIGURE 6–11

PROPOSED SAMPLE LOCATIONS
UNDERGROUND STORAGE TANKS
AT BUILDING #810

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

INTERNATIONAL TECHNOLOGY CORPORATION

HP810(*HP3)

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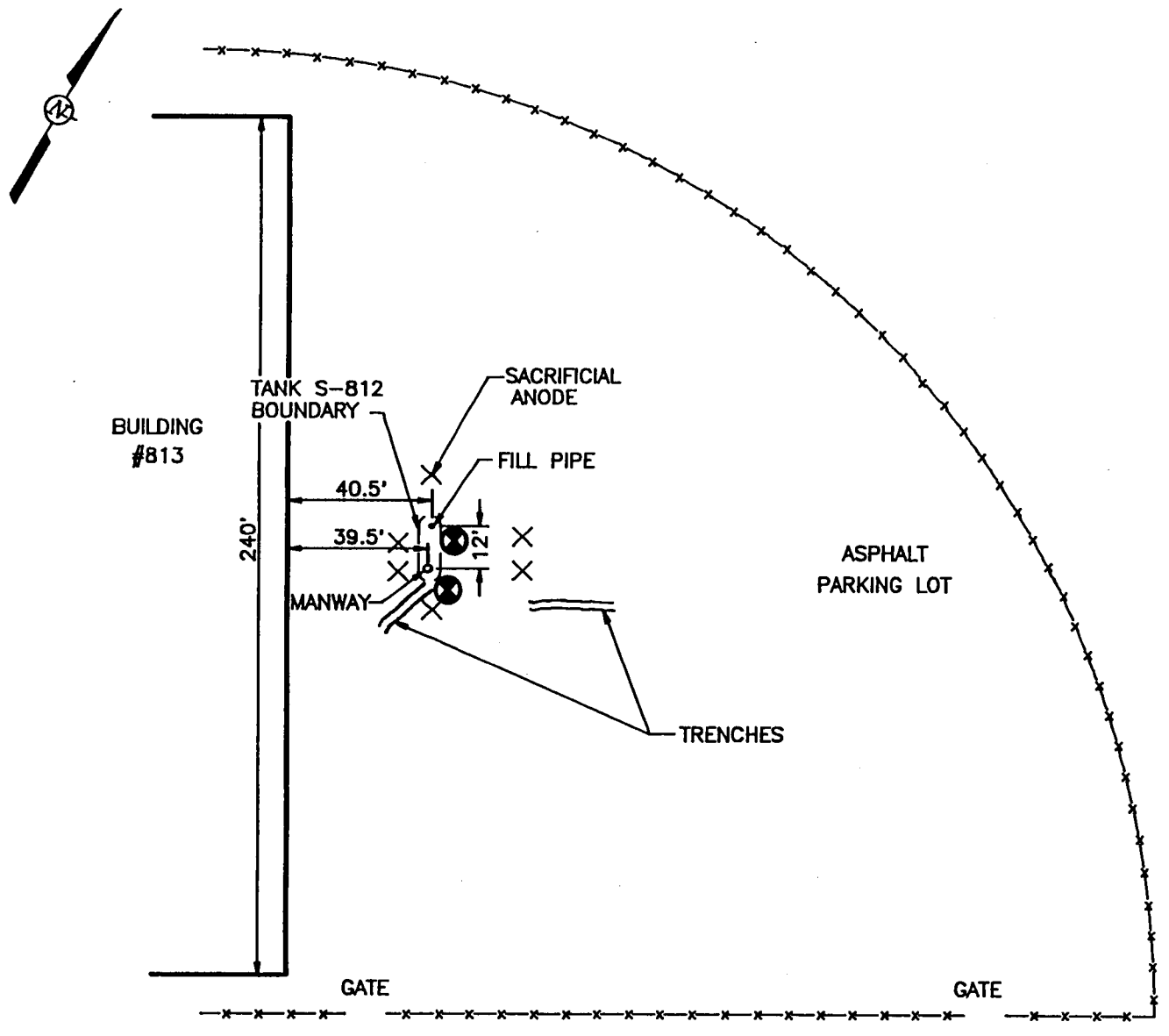

LEGEND:

⊗ SOIL BORING

DWG. NOT TO SCALE

FIGURE 6-12

PROPOSED SAMPLE LOCATIONS
UNDERGROUND STORAGE TANK
AT BUILDING #813

PREPARED FOR

HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

INTERNATIONAL TECHNOLOGY CORPORATION

HP813(*HP3)

LIST OF REFERENCES

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ENGINEERING AND ARCHITECTURAL DRAWINGS SUPPLIED BY
WESTDIVNAV FAC ENG COM

DRAWING NO.	TITLE
1	PWC Drawing Number 11998 - Expansion of Central Steam Power Plant - Building 203, Service Pits.
2	PWC Drawing Number 110926, Building 203.
3	Enlarged View of PWC Drawing Number 110926.
4	PWC Drawing Number 110832 Steam and Condensate System, Condensate Return to Building 263 Underground Storage Tank General Plan.
5	Enlarged View of PWC Drawing Number 110832.
6	PWC Drawing Number 117547, Building 203 Reline Underground Water Tank Level Controls.
7	PWC Drawing Number 113128, Fuel Oil Storage and Emergency Oil Dumping Facilities, 5,000 bbl Concrete Oil Tank Details.
8	PWC Drawing Number 117548, Building 203 Reline Underground Water Tank Details.
9	PWC Drawing Number 113128 Fuel Oil Storage and Emergency Oil Dumping Facilities, 5,000 bbl Concrete Oil Tank.
10	PWC Drawing Number 114727 Building 270 Conversion to Paint Shop Paint Thinner Storage Tank.
11	PWC Drawing Number 118820 Building 709 Service Station Additional Pump Island and Storage Tank.
12	PWC Drawing Number 116485 Paving Plan Gasoline Storage Tanks Commissary Building Number 803.
13	PWC Drawing Number 112247 Roads, Tracks and Services Diesel Oil Station Building 811.
14	PWC Drawing Number 110424 Roads, Tracks, and Services Diesel Oil Station Building 811.

APPENDIX A – GEOPHYSICAL SURVEY REPORT

TECHNICAL REPORT
UNDERGROUND TANK INVESTIGATION

DATED 7 DECEMBER 1989

GEOPHYSICAL REPORT
NAVAL STATION TREASURE ISLAND
HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

PREPARED FOR:

NAVAL STATION TREASURE ISLAND
HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

PREPARED BY:

IT CORPORATION
4585 PACHECO BOULEVARD
MARTINEZ, CALIFORNIA 94553

PROJECT NO. 409617
NOVEMBER 1988

TABLE OF CONTENTS

NAVAL STATION TREASURE ISLAND
HUNTERS POINT ANNEX
MAGNETICS SURVEY

1.0 INTRODUCTION

IT Corporation (IT) was contracted by Martin Marietta Energy Systems (Martin Marietta) to conduct a site investigation at the Naval Station Treasure Island, Hunters Point Annex in San Francisco, California. Included in this investigation is a geophysical study (magnetics) to determine the location of known and suspected buried tanks and their associated pipes at 13 different sites within the shipyard. Specifically, the study was conducted by using a flux-gate magnetometer at each tank site and a proton precession magnetometer at the site near Building 118. The study was conducted on July 27 and 28, 1988.

2.0 GEOPHYSICAL INSTRUMENTATION

This chapter identifies the instrumentation used in this study and discusses its capabilities and limitations. The flux-gate magnetometer can detect buried metal to a depth of approximately four feet below the ground surface. The instrument is sensitive to both aboveground and subsurface magnetic metal materials. A drum or tank buried greater than four feet below ground surface under reinforced concrete is difficult or impossible to detect with this instrument. Metal pipelines near buried tanks create underground magnetic interferences that make it difficult or impossible to accurately determine the location of a tank(s). The flux gate is a quick means of identifying shallow subsurface magnetic metal.

The proton precession magnetometer (EDA OMNI IV) can detect buried metal much deeper than the flux-gate magnetometer because of its increased sensitivity. However, because of this increased sensitivity, it is greatly influenced by overlying power lines, metal on or within nearby buildings, reinforced concrete, and underground pipes. The use of this instrument was attempted at many of the 13 sites but too much interference caused it to be ineffective. Because of this, the OMNI IV magnetometer was successful at only one site. The area adjacent to Building 118 was situated away from any cultural interferences which made it possible to utilize the OMNI IV magnetometer to determine magnetic anomalies.

3.0 FIELD PROCEDURES

The geophysical study consisted of utilizing magnetics to delineate subsurface tank locations and orientations and pipelines extending from the tanks. At most of the sites, the tank locations could be visually determined from tank manways and shutoff valves associated with each tank. In these instances, the flux-gate magnetometer was used to determine tank orientation and pipes extending from the tank by scanning the area around the tank valves until the tank boundary was identified. To detect the location and direction of associated subsurface piping, the area around the perimeter of the tank was also scanned.

Where tank locations were unknown, the flux-gate magnetometer was used to trace the vent pipes back to the tank. If the tank could not be located, the entire area was scanned with the flux-gate magnetometer.

Once the tanks and associated pipes were identified, red paint was sprayed on the ground surface identifying the outline of the subsurface structures. In areas where tank boundaries were uncertain, the painted lines were dashed, indicating the approximate location.

4.0 GEOPHYSICAL RESULTS

This chapter includes a brief description of each individual site evaluated in this study. The sites are divided into two categories. Category 1 includes sites where the approximate tank boundaries could be identified. Category 2 includes sites where either too much interference existed or the tanks were too deep to be detected. For additional information and site sketches for each tank area, refer to the field notes in Appendix A.

CATEGORY 1

This includes sites where approximate tank locations could be identified by visual inspection of the area and by using geophysics.

Building 253

The four tanks in this area (Tanks S-001, S-002, S-003, and S-004) were identified but not with a high degree of confidence because the tanks appear to be buried deeper than four feet. The individual tanks were not identified but the tank area perimeter was marked with paint. Pipes were identified extending from the tank area to the gas pump island and from the tank area to the pipe vents located next to the building. A trench with pipes was also identified near the tank area but does not appear to be associated with the tanks. All pipe trenches and tank boundaries were marked with paint.

Building 251

A tank area was detected at the manhole covers and vent pipes on the side of the building near the garage of Building 251. It cannot be determined if there is one or two tanks within this area; however, some metal was detected between the pipe vent located next to the building and the manhole covers, possibly indicating the boundaries between two tanks.

Near exit doors of the same building, an underground pipe was traced from a vent on the side of the building. It was detected for approximately 15 feet away from the building before its depth apparently exceeded the sensitivity of the flux-gate magnetometer.

Building 304

The tank area was readily detected and associated pipes between the tanks were identified. The boundaries between the tanks could not be determined, probably because the tanks are situated too close together. The underground vent pipes could be detected from the tanks towards the gas pump island until they become buried underneath the reinforced concrete. The vent pipe located on the side of the building could not be detected to the tank area; however, it may be in the same trench with the pipes connecting the tanks to the gas pump island. An anomaly exists near the trench with the pump pipes and the corner of the tank and is also marked with a dashed line as are the boundaries of the tank area.

Building 435

A nonreinforced concrete pad near Building 435 was scanned and an anomalous area was identified near the old gas pumps. This area was marked with dashed lines using spray paint. Adjacent to the concrete pad was an asphalt road separated by a a metal fence. On the asphalt, two "clean-out vents" located next to the fence were visually identified. The asphalt was scanned around the clean-out vents but nothing could be detected because of the interference created by the fence. The zone of interference is approximately two feet from the fence. It is believed that the tanks lie parallel to the fence but the flux-gate magnetometer was unable to identify anything beyond the interference of the fence.

Building 500

The general location of Tank S-508 was identified but the exact location could not be pinpointed because of some scrap metal on the surface and possibly some scrap metal in the fill material around the tank and ditch. The approximate tank location is outlined with paint. The underground pipe connecting the tank to the vent pipe on the side of the building was also identified along with several other pipes near the building. The exact locations of each individual pipe could not be identified and a small triangular area that included these pipes was marked with paint near the building.

Building 709

The locations of the four tank boundaries (Tanks S-711, S-712, S-713, and S-714) were identified and marked in the field with paint. The area between the individual tanks could not be distinguished because the tanks are too close together. A metal bar within the concrete outlined the area of the tanks and probably influenced where the perimeter boundary of the tanks was located. A corner tank is not clearly identified because a slab of reinforced concrete that underlies the gas pump islands is located near this corner. The underground pipes connecting the tanks to the vent pipes located next to the service station building were also identified. Four small valve covers exist near the tanks but pipes connecting these covers with these tanks could not be identified. They are either not associated with tanks or the connecting pipes are buried deeper than four feet. Pipes were also identified near the tank boundary in a direction away from the building and could only be detected up to five feet away from the tank boundary.

Building 810

The approximate locations of the two tank boundaries (Tanks S-801 and S-802) were identified and marked in the field with paint. The area between the two tanks could not be distinguished because the tanks are too close together. The exact locations of the tank boundaries could not be detected because of several interferences, including small pieces of scrap metal lying on the ground and a high-voltage transformer near the buried tanks. Underground pipes associated with the tanks were also detected to a distance of five feet away from the tanks where, at that point, they are either buried at a depth greater than four feet or are not present.

Behind the old service station building, a small tank was identified with its associated pipes. A second magnetic anomaly was also identified but was apparently associated with the tank. Both areas were marked with paint.

Building 118

Building 118 had been razed but the general outline of the building is still evident. Since the general location of the tanks was not known, the entire area of the old building location required a magnetic survey. The parking lot next to the site, Parking Lot 45, was not included in the survey. The OMNI IV proton precession magnetometer was used to determine the location of the tank. Overlying power lines and scrap metal did not exist in the area to cause any magnetic interference.

A 20-by-20-foot grid was laid out over a 16,000 square foot area and readings were recorded every 20 feet. Two magnetic highs were noted in the field (Figure 1). From these general locations, the flux-gate magnetometer was used to determine the exact boundary locations and any associated pipes which may be present.

The OMNI IV magnetometer data were contoured and are presented in Figure 1. In the northeast corner of the figure, a small metal boat caused the magnetic readings to be high. These data were deleted during processing because they are not associated with buried metal.

Anomaly A appears to be a tank but pipes associated with it were not detected. Anomaly B also appears to be a tank with pipes extending from it, as detected from the flux-gate magnetometer. These pipes could be detected about ten feet from the approximate boundary of the tank. The tank boundaries were outlined with spray-painted dashed lines and with pin flags.

CATEGORY 2

This chapter describes sites where approximate tank boundaries could not be identified.

Building 203

Three tanks in the area (Tanks S-209, S-211, and S-212) could not be detected because of too much above- and below-ground metal interference in the area, such as reinforced concrete and underground pipelines. The large concrete tank (Tank S-213) is approximately the same size as its concrete cap, as it was visually identified by removing the manway and looking inside the tank. Pipes associated with the tank could not be detected.

Building 205

The boundary for Tank S-214 could not be clearly detected. Small anomalous patterns existed everywhere, making it difficult to pinpoint the boundaries. An estimated boundary location was marked near the building. Some pipelines were detected and marked; however, they could not be tracked very far because they probably became buried deeper than four feet.

Building 270

Reinforced concrete exists between the two buildings where the tank is believed to be situated along with several underground pipelines. This made it impossible to locate the tank. No tank boundaries could be identified in this area.

Building 813

The tank area was defined by a series of cathode protection wells surrounding the tank area; however, the tank could not be detected when the area was scanned with the flux-gate magnetometer. The tank is probably buried deeper than four feet. The OMNI IV magnetometer was used without success due to the

sporadically high readings caused by the nearby wells. However, two areas which appear to be buried shallow pipes were detected outside the well area and marked with spray paint.

Building 116

A small area of concrete on the concrete pad next to Building 116 appeared to be the location of the tank. It appears that part of the pad was excavated to install a tank or to remove a tank. However, when the area was scanned, nothing was detected. The tank was probably removed and the area capped with new concrete. A small reinforced concrete pad next to the building appears to be too small to cover the tank and it is unlikely the tank is buried there. The area around the sides of the building was scanned with the flux-gate magnetometer but nothing was detected.

5.0 SUMMARY

The tank boundaries could only be identified with some confidence at a few sites (tanks near Buildings 709, 118, and 304). At other sites, the boundaries were approximate, according to our best estimate, based on the limitations set by the abundant metal near the sites or by the tanks being buried too deep (tanks near Buildings 810, 500, 435, 253, and 251). At the remaining sites (tanks near Buildings 813, 116, 270, 203, and 205), the tanks or tank boundaries could not be located with any confidence. At Building 116, however, it is believed that the tank has been removed.

Caution should be used at all the sites when drilling or conducting a soil-gas survey because most of the identified boundaries are not exact locations. At least a two-foot buffer zone should surround the boundaries when performing any drilling.

TABLE.

TABLE 1

UNDERGROUND TANKS AND TANK SAMPLE SUMMARY
AT EX-HUNTER'S POINT NAVAL SHIPYARD

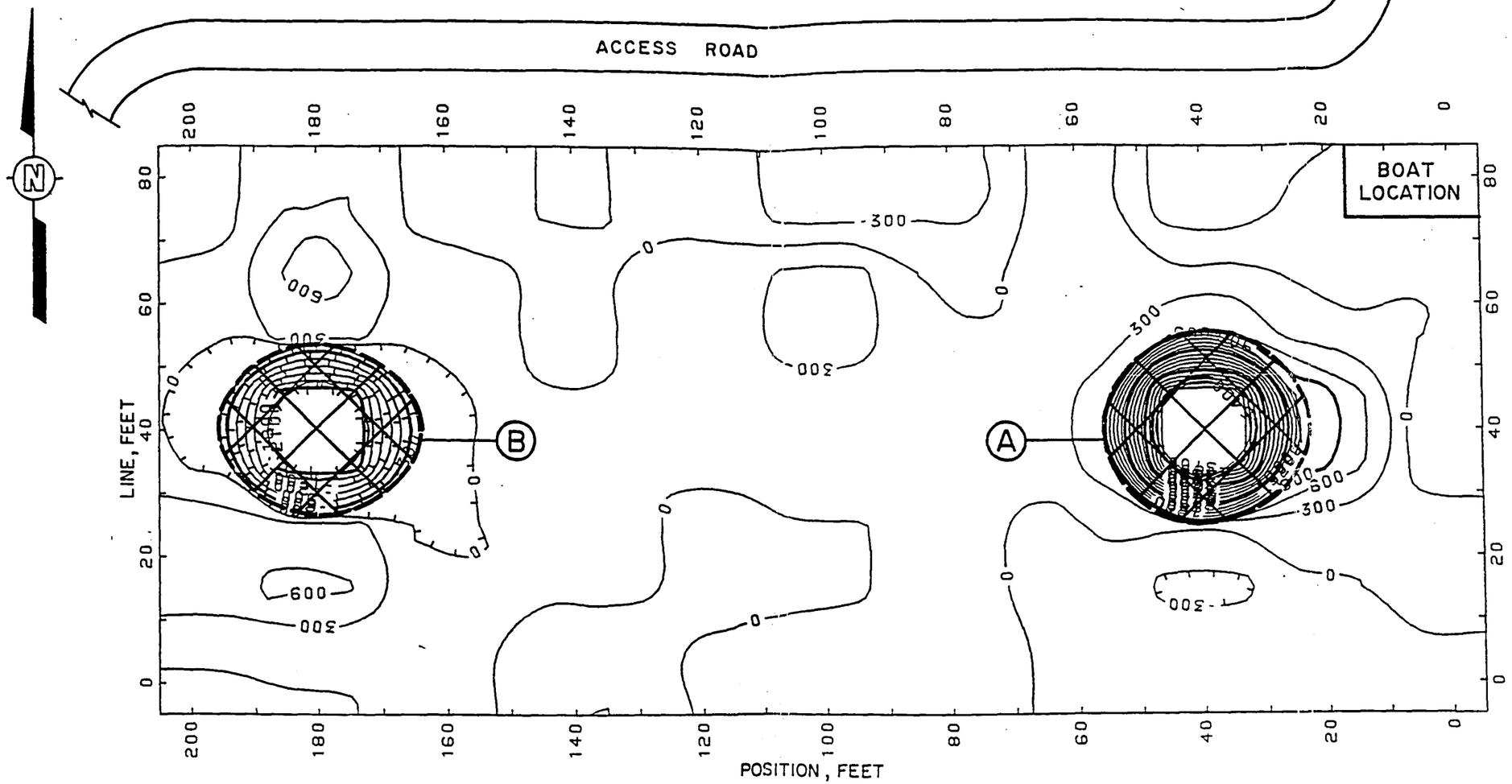
TANK NUMBER	LOCATION	GALLONS	CONTENTS	CONSTRUCTION
S-001	Bldg. 253	3,000	Gasoline	Steel
S-002	Bldg. 253	3,000	Gasoline	Steel
S-003	Bldg. 253	3,000	Gasoline	Steel
S-004	Bldg. 253	3,000	Gasoline	Steel
S-135(?)	Bldg. 116	1,250	Fuel Oil	Steel
S-135(?)	Bldg. 118	750	Fuel Oil	Steel
S-209	Bldg. 203	210,000	Fuel Oil	Concrete
S-211	Bldg. 203	3,000	Fuel Oil	Steel
S-212	Bldg. 203	4,500	Fuel Oil	Steel
S-213	Bldg. 203	35,000	Treated Water	Concrete
S-214	Bldg. 205	21,924	Fuel Oil	Steel
S-215	Bldg. 270	25,320	Paint Thinner	Steel
S-251(1)	Bldg. 251	Unknown	Unknown	Unknown
S-251(2)	Bldg. 251	Unknown	Unknown	Unknown
S-304	Bldg. 304	6,880	Gasoline	Steel
S-305	Bldg. 304	6,880	Gasoline	Steel
S-435(1)	Bldg. 435	Unknown	Unknown	Unknown
S-435(2)	Bldg. 435	Unknown	Unknown	Unknown
S-508(?)	Bldg. 500	750	Fuel Oil	Steel
S-711	Bldg. 709	5,000	Gasoline	Steel
S-712	Bldg. 709	5,000	Gasoline	Steel
S-713	Bldg. 709	5,000	Gasoline	Steel
S-714	Bldg. 709	5,000	Diesel	Steel
S-715	Bldg. 709	500	Waste Oil	Steel
S-801	Bldg. 810	10,800	Diesel	Steel
S-802	Bldg. 810	6,880	Fresh Water/ Diesel	Steel
S-812	Bldg. 813	10,000	Fuel Oil	Steel

(?) - Tank may or may not exist.
(1) - Individual tank within a tank group.

FIGURE

DRAWN BY	CHECKED BY	APPROVED BY	D.W.	DRAWING NUMBER
B.KUMPF 22AUG88			9.1.88	409617-B1

BUILDING 117



NOTES:

1. CONTOUR INTERVAL USED IS 300 GAMMAS/METER.
2. DATA INFLUENCED BY CULTURAL INTERFERENCE HAVE BEEN DELETED.
3. ANOMALIES A & B ARE MARKED WITH PINFLAGS AT THE SITE.
4. BUILDING 116 IS LOCATED TO THE SOUTH.

LEGEND:

~300~	MAGNETIC CONTOURS IN GAMMAS / METER
	MAGNETIC ANOMALY INDICATING A SIGNIFICANT AMOUNT OF BURIED METAL
A & B	ANOMALY DESIGNATION

SCALE
0 20 40 FEET

FIGURE 1

MAGNETIC ISO-GRADIENT MAP
BUILDING 118

PREPARED FOR
NAVAL STATION TREASURE ISLAND
HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

INTERNATIONAL TECHNOLOGY CORPORATION

132298

APPENDIX B – SOIL GAS SURVEY DATA

TECHNICAL REPORT
UNDERGROUND TANK INVESTIGATION

DATED 7 DECEMBER 1989

GC AND TIP RESULTS FOR HUNTERS POINT SOIL GAS SURVEY

BUILDING 253

SAMPLE LOCATION	TIP* READING	GC RESULTS (ppb) 1,1-DCE	1,1-DCA	CIS-DCE	1,1,1-TCA	BENZENE	TCE	1,1,2-TCA	TOLUENE	m- AND p-XYLENE	o-XYLENE	COMMENTS	DATE
AS1	1,445.8	111,850	10,310,000	2,220,500	23,525,000	353,700	1,442,500	2,247,500	233,050	(<32,500) ND	45,590	Fingerprint looks like gasoline in heavy concentrations	01/11/89
AS2	69.9	ND	7,280	2,053	19,328	819	2,257	37,524	130	481	ND	Fingerprint looks like gasoline	01/06/89
AS3	80.1	ND	1,352	222	ND	131	1,231	ND	169	131	ND	Fingerprint looks like gasoline	01/06/89
AS4	18.9	ND	1,238	566	4,470	181	212	6,869	172	39	ND	Fingerprint looks like gasoline	01/06/89
AS5	0.3	ND	ND	ND	ND	ND	106	ND	97	57	62		01/09/89
AS6	589.9	8,518	979,200	97,416	128,410	25,376	170,526	(<60,600) ND	89,914	5,526	(<5,200) ND	Fingerprint looks like gasoline	01/09/89
AS7	991.9	13,520	1,305,600	141,696	478,720	38,064	772,633	(<60,600) ND	1,113,929	208,464	174,720	Fingerprint looks like gasoline	01/09/89
AS8	679.9	4,960	2,040,000	387,500	2,288,000	91,500	179,500	151,500	71,500	65,500	(<13,000) ND	Fingerprint looks like gasoline	01/09/89

*ppm with respect to 100 ppm isobutylene.

GC AND TIP RESULTS FOR HUNTERS POINT SOIL GAS SURVEY
BUILDING 203

SAMPLE LOCATION	TIP* READING	GC RESULTS (ppb) 1,1-DCE	1,1-DCA	CIS-DCE	1,1,1-TCA	BENZENE	TCE	1,1,2-TCA	TOLUENE	m- AND p-XYLENE	o-XYLENE	COMMENTS	DATE
AS1	0.2	ND	600	55	ND	43	139	5,252	ND	390	259	1,1,2-TCA concentration fairly high	01/10/89
AS2	0.2	223	ND	635	7,603	254	294	ND	624	808	250	Many unknowns 1,1,1-TCA concentration high	01/09/89

*ppm with respect to 100 ppm isobutylene.

GC AND TIP RESULTS FOR HUNTERS POINT SOIL GAS SURVEY
BUILDING 270

SAMPLE LOCATION	TIP* READING	GC RESULTS (ppb) 1,1-DCE	1,1-DCA	CIS-DCE	1,1,1-TCA	BENZENE	TCE	1,1,2-TCA	TOLUENE	m- AND p-XYLENE	o-XYLENE	COMMENTS	DATE
AS1	5.1	ND	ND	ND	ND	ND	ND	ND	ND	63	ND	One large unknown at retention time of 6465 and measured response of 1.8 VS	01/06/89
AS2	2.6	ND	ND	ND	ND	ND	2,678	313	ND	ND	ND		01/05/89
AS3	2.9	ND	ND	ND	ND	ND	ND	ND	ND	39	ND		01/06/89
AS4	8.0	ND	ND	ND	ND	ND	ND	ND	ND	53	48		01/06/89

*ppm with respect to 100 ppm isobutylene.

GC AND TIP RESULTS FOR HUNTERS POINT SOIL GAS SURVEY
BUILDING 251

SAMPLE LOCATION	TIP* READING	GC RESULTS (ppb) 1,1-DCE	1,1-DCA	CIS-DCE	1,1,1-TCA	BENZENE	TCE	1,1,2-TCA	TOLUENE	m- AND p-XYLENE	o-XYLENE	COMMENTS	DATE
AS1	ND	ND	68	ND	ND	19	ND	2,068	ND	242	133	1,1,2-TCA fairly high	01/10/89
AS2	ND	ND	ND	ND	ND	ND	19	1,254	ND	183	146	1,1,2-TCA fairly high	01/10/89
AS3	ND	ND	ND	ND	ND	ND	ND	ND	ND	44	29	Low detection of xylene	01/10/89

*ppm with respect to 100 ppm isobutylene.

GC AND TIP RESULTS FOR HUNTERS POINT SOIL GAS SURVEY
BUILDING 304

SAMPLE LOCATION	TIP* READING	GC RESULTS (ppb) 1,1-DCE	1,1-DCA	CIS-DCE	1,1,1-TCA	BENZENE	TCE	1,1,2-TCA	TOLUENE	m- AND p-XYLENE	o-XYLENE	COMMENTS	DATE
AS1	1,557.8	(<11,250) ND	1,370,500	156,600	1,712,700	(<15,000) ND	172,320	1,575,200	20,525	(<32,500) ND	(<32,000) ND	Fingerprint resembles gasoline	01/11/89
AS2	1,667.8	(<11,250) ND	2,274,500	349,548	3,168,000	93,105	212,500	(<378,750) ND	246,582	86,400	(<32,500) ND	Looks like gasoline	01/11/89
AS3	302.3	ND	29,592	6,288	137,360	3,120	4,112	208,240	3,033	4,120	ND	Looks like gasoline	01/11/89
AS4	1,580.8	8,752	1,586,400	455,840	2,593,600	98,960	311,200	4,592,800	55,200	196,992	68,408	Looks like gasoline	01/11/89

*ppm with respect to 100 ppm isobutylene.

GC AND TIP RESULTS FOR HUNTERS POINT SOIL GAS SURVEY
BUILDING 435

SAMPLE LOCATION	TIP* READING	GC RESULTS (ppb) 1,1-DCE	1,1-DCA	CIS-DCE	1,1,1-TCA	BENZENE	TCE	1,1,2-TCA	TOLUENE	m- AND p-XYLENE	o-XYLENE	COMMENTS	DATE
AS1	ND	ND	211	ND	ND	25	28	3,731	63	368	250		01/10/89
AS2	7.7	ND	24,176	5,576	ND	4,076	31,856	ND	ND	811	378	Fingerprint resembles gasoline	01/11/89
AS3	1.4	ND	380	28	ND	53	ND	1,100	ND	47	62	Several unknown peaks	01/11/89
AS4	0.6	ND	6,320	1,689	12,764	624	1,356	18,088	410	490	ND	Several unknown peaks. Could be gasoline.	01/11/89

*ppm with respect to 100 ppm isobutylene.

MA ENG:4625-T/072089/6

GC AND TIP RESULTS FOR HUNTERS POINT SOIL GAS SURVEY
BUILDING 709

SAMPLE LOCATION	TIP* READING	GC RESULTS (ppb) 1,1-DCE	1,1-DCA	CIS-DCE	1,1,1-TCA	BENZENE	TCE	1,1,2-TCA	TOLUENE	m- AND p-XYLENE	o-XYLENE	COMMENTS	DATE
AS1	253.2	ND	6,409	1,042	12,046	1,825	3,056	13,248	2,994	1,152	216	Looks like gasoline	01/05/89
AS2	906.8	11,012	1,432,280	154,216	1,521,600	25,000	115,656	1,059,840	ND	3,329	ND	Looks like gasoline	01/05/89
AS3	680.3	(<11,250) ND	38,760,000	2,472,300	35,376,000	646,600	(<26,250) ND	(<378,750) ND	820,640	(<32,500) ND	91,000	Fingerprint looks like gasoline Very heavy contamination	01/09/89
AS4	852.3	253,500	17,085,000	1,383,750	18,920,000	228,750	1,029,000	(<716,879) ND	178,400	202,000	(<81,250) ND	Fingerprint of gasoline Very heavy contamination	01/09/89
AS5	14.0	2,488	284,960	16,096	251,280	3,242	21,252	(<3,030) ND	3,700	556	122	Fingerprint assembles gasoline	01/09/89
AS6	10.1	ND	1,300	57	1,150	ND	87	4,771	ND	299	ND	Several unknown peaks	01/10/89
AS7	2.1	ND	640	204	2,851	267	620	8,652	220	484	ND	Several unknown peaks (TCA concentrations high	01/11/89
AS8	2.5	ND	542	42	787	133	570	4,852	136	524	111.0	TCA concentrations high	01/11/89

*ppm with respect to 100 ppm isobutylene.

APPENDIX C – DRILLING LOGS

TECHNICAL REPORT
UNDERGROUND TANK INVESTIGATION

DATED 7 DECEMBER 1989

BORING NO. S-209(1)

FIELD GEOLOGIST S. Hickey
EDITED BY H. Fleck
CHECKED BY T. Curran
TOTAL DEPTH 11 feet

COORDINATES N NA, E NA
DATE BEGAN 2-22-89
DATE FINISHED 2-22-89
GROUND SURFACE EL. NA

DEPTH IN FEET	SAMPLE TYPE & NUMBER HPA-	RECOVERY (In.)	P.I.D. READING (ppm)	WELL SUMMARY	BLOWS ON SAMPLER PER (6")	USCS	PROFILE	DESCRIPTION
0								3" Asphalt
								SILTY GRAVEL; gray brown to dark yellowish brown, moist, dense, slightly to non-plastic (Fill).
5	38	10/18				GM		
								▽ Ground water encountered at 7 ft..
10								Heavy fuel oil observed in cuttings ~9 ft. Very large gravels and cobbles at 9.5 ft. serpentinite (Fill ?).
								TOTAL DEPTH 11 FEET (Refusal)
15								
20								
25								
30								
35								

DRILLING CO.: Exploration Geo Services
San Jose, California

DRILL METHOD: 6" Dia. Auger, 2"I.D. Split Spoon

PROJECT NO.: 409617.4.83
CLIENT: Martin Marietta Energy Systems
LOCATION: Hunter's Point Annex; Bldg. 203
San Francisco, California

209-1(*HP-1)

SEE LEGEND FOR LOGS AND TEST PITS FOR EXPLANATION OF SYMBOLS AND TERMS

IT ...Creating a Safer Tomorrow

BORING NO. S-209(2)

FIELD GEOLOGIST S. Hickey
EDITED BY H. Fleck
CHECKED BY T. Curran
TOTAL DEPTH 8 feet

COORDINATES N NA
E NA
DATE BEGAN 2-22-89
DATE FINISHED 2-22-89
GROUND SURFACE EL. NA

DEPTH IN FEET	SAMPLE TYPE & NUMBER HPA-	RECOVERY (in.)	P.I.D. READING (ppm)	WELL SUMMARY	BLOWS ON SAMPLER PER (6")	USCS	PROFILE	DESCRIPTION
0								3" Asphalt
						GM		SILTY GRAVEL; gray brown to dark yellow brown, damp, dense, non-plastic (Fill).
5	39	9/18						
	40 dup	12/18						
								▽Ground water encountered at 8 ft..
								TOTAL DEPTH 8 FEET
10								
15								
20								
25								
30								
35								

DRILLING CO.: Exploration Geo Services
San Jose, California

DRILL METHOD: 6" Dia. Auger, 2"I.D. Split Spoon

PROJECT NO.: 409617.4.83
CLIENT: Martin Marietta Energy Systems
LOCATION: Hunter's Point Annex; Bldg. 203
San Francisco, California

209-2(*HP1)

SEE LEGEND FOR LOGS AND TEST PITS
FOR EXPLANATION OF SYMBOLS AND TERMS

IT ...Creating a Safer Tomorrow

BORING NO. S-213(1)

FIELD GEOLOGIST S. Hickey
EDITED BY H. Fleck
CHECKED BY T. Curran
TOTAL DEPTH 7 feet

COORDINATES N NA E NA
DATE BEGAN 2-22-89
DATE FINISHED 2-22-89
GROUND SURFACE EL. NA

DEPTH IN FEET	SAMPLE TYPE & NUMBER HPA-	RECOVERY (in.)	P.I.D. READING (ppm)	WELL SUMMARY	BLOWS ON SAMPLER PER (6")	USCS	PROFILE	DESCRIPTION
0								3" asphalt
						GM		SILTY GRAVEL; gray brown to dark yellowish brown, moist, dense, non-plastic (Fill).
						GP		Large cobbles to boulders, shale/serpentinite, dark gray to dark green, wet, dense, non-plastic.
5	N/A	0/3						Two sample drives attempted, no recovery-refusal.
	N/A	0/3						
								TOTAL DEPTH 7 FEET
								Refusal at 7 feet
10								NOTE: No ground water encountered.
15								
20								
25								
30								
35								

DRILLING CO.: Exploration Geo Services
San Jose, California

DRILL METHOD: 6" Dia. Auger, 2"I.D. Split Spoon

PROJECT NO.: 409617.4.83
CLIENT: Martin Marietta Energy Systems
LOCATION: Hunter's Point Annex; Bldg. 203
San Francisco, California

213-1(*HP1)

SEE LEGEND FOR LOGS AND TEST PITS
FOR EXPLANATION OF SYMBOLS AND TERMS

IT ...Creating a Safer Tomorrow

BORING NO. S-213(2)

FIELD GEOLOGIST S. Hickey
EDITED BY H. Fleck
CHECKED BY T. Curran
TOTAL DEPTH 15 feet
COORDINATES N NA E NA
DATE BEGAN 2-22-89
DATE FINISHED 2-22-89
GROUND SURFACE EL. NA

DEPTH IN FEET	SAMPLE TYPE & NUMBER HPA-	RECOVERY (In.)	P.I.D. READING (ppm)	WELL SUMMARY	BLOWS ON SAMPLER PER (6")	USCS	PROFILE	DESCRIPTION
0								3" Asphalt
						GM		SILTY GRAVEL; reddish brown to yellow brown, moist, dense, non-plastic (Fill).
5	41	14/18						
						GP		SANDY GRAVEL; reddish brown to yellow brown, wet, dense, non-plastic (Fill). Increases to large cobbles at 8 ft.. Cobbles of serpentinite, shale and greenstone. At 12 ft., metal rebar in cuttings, 1/2" diameter.
10								
						GC		CLAYEY GRAVEL; reddish brown to greenish gray, wet, stiff, low plasticity.
15								TOTAL DEPTH 15 FEET
								NOTE: No ground water encountered.
20								
25								
30								
35								

DRILLING CO.: Exploration Geo Services
San Jose, California

DRILL METHOD: 6" Dia. Auger, 2"I.D. Split Spoon

PROJECT NO.: 409617.4.83
CLIENT: Martin Marietta Energy Systems
LOCATION: Hunter's Point Annex; Bldg. 203
San Francisco, California

213-2(*HP1)

SEE LEGEND FOR LOGS AND TEST PITS
FOR EXPLANATION OF SYMBOLS AND TERMS

IT ...Creating a Safer Tomorrow

BORING NO. S-214(1)

FIELD GEOLOGIST S. Hickey
EDITED BY H. Fleck
CHECKED BY T. Curran
TOTAL DEPTH 10 feet

COORDINATES N NA E NA
DATE BEGAN 2-21-89
DATE FINISHED 2-21-89
GROUND SURFACE EL. NA

DEPTH IN FEET	SAMPLE TYPE & NUMBER HPA-	RECOVERY (in.)	P.I.D. READING (ppm)	WELL SUMMARY	BLOWS ON SAMPLER PER (6")	USCS	PROFILE	DESCRIPTION
0						GM		2.5" Asphalt SANDY GRAVEL; reddish brown, damp, dense, non-plastic(Fill).
						SC		CLAYEY SAND; dark gray to dark green, moist, dense, low plasticity, with gravel (Fill).
5	29	12/18				GP		SANDY GRAVEL; light green to dark green, moist, medium dense, non-plastic, with cobbles of deeply weathered serpentinite. Petroleum odor below 4 ft.. Stained dark gray to black 7 to 10 ft..
						SP		GRAVELLY SAND; light green with black petroleum staining, wet to saturated, medium dense, low plasticity. ▽ Ground water encountered at 9'.
10								TOTAL DEPTH 10 FEET
15								
20								
25								
30								
35								

DRILLING CO.: Exploration Geo Services
San Jose, California

DRILL METHOD: 6" Dia. Auger, 2"I.D. Split Spoon

PROJECT NO.: 409617.4.83
CLIENT: Martin Marietta Energy Systems
LOCATION: Hunter's Point Annex; Bldg. 205
San Francisco, California

214-1(*HP1)

SEE LEGEND FOR LOGS AND TEST PITS
FOR EXPLANATION OF SYMBOLS AND TERMS

IT ...Creating a Safer Tomorrow

BORING NO. S-508(1)

FIELD GEOLOGIST S. Hickey
EDITED BY H. Fleck
CHECKED BY T. Curran
TOTAL DEPTH 8 feet

COORDINATES N NA
E NA
DATE BEGAN 2-21-89
DATE FINISHED 2-21-89
GROUND SURFACE EL. NA

DEPTH IN FEET	SAMPLE TYPE & NUMBER HPA-	RECOVERY (in.)	P.I.D. READING (ppm)	WELL SUMMARY	BLOWS ON SAMPLER PER (6")	USCS	PROFILE	DESCRIPTION
0						GW		SANDY GRAVEL; dark gray, damp, dense, non-plastic, angular gravels (Fill).
						SC		CLAYEY SAND; greenish gray, wet, medium dense to dense, low plasticity, with gravels and cobbles of serpentinite (Fill).
	27	6/18						
5								▽ Ground water encountered at 5.0 feet (perched)
						SW		÷ SILTY SAND; orange brown to reddish brown, wet, medium dense, slightly plastic (Fill ?).
								TOTAL DEPTH 8 FEET Refusal
10								
15								
20								
25								
30								
35								

DRILLING CO.: Exploration Geo Services
San Jose, California

DRILL METHOD: 6" Dia. Auger, 2"I.D. Split Spoon

PROJECT NO.: 409617.4.83
CLIENT: Martin Marietta Energy Systems
LOCATION: Hunter's Point Annex; Bldg. 500
San Francisco, California

508-1(*HP1)

SEE LEGEND FOR LOGS AND TEST PITS
FOR EXPLANATION OF SYMBOLS AND TERMS

IT ...Creating a Safer Tomorrow

BORING NO. S-508(2)

FIELD GEOLOGIST S. Hickey
EDITED BY H. Fleck
CHECKED BY T. Curran
TOTAL DEPTH 10 feet

COORDINATES N NA, E NA
DATE BEGAN 2-21-89
DATE FINISHED 2-21-89
GROUND SURFACE EL. NA

DEPTH IN FEET	SAMPLE TYPE & NUMBER HPA-	RECOVERY (in.)	P.I.D. READING (ppm)	WELL SUMMARY	BLOWS ON SAMPLER PER (6")	USCS	PROFILE	DESCRIPTION
0						GW		2.5 " Asphalt SANDY GRAVEL; yellow brown to orange brown, damp, dense, non-plastic (Fill).
						SC		CLAYEY SAND; greenish gray to dark gray, moist, dense to medium dense, low plasticity (Fill).
5	28	8/18				SM		SILTY SAND; yellow brown to dark orange brown, moist, medium dense, low plasticity, well graded sands with gravel (Fill ?).
						GC		▽ Ground water encountered at 9 ft. CLAYEY GRAVEL with sand; dark green to dark gray, very wet to saturated, medium dense, low plasticity. (clay moderately plastic) Gravels of serpentinite and greenstone.
10								TOTAL DEPTH 10 FEET
15								
20								
25								
30								
35								

DRILLING CO.: Exploration Geo Services
San Jose, California

DRILL METHOD: 6" Dia. Auger, 2"I.D. Split Spoon

PROJECT NO.: 409617.4.83
CLIENT: Martin Marietta Energy Systems
LOCATION: Hunter's Point Annex; Bldg. 500
San Francisco, California

508-2(*HP1)

SEE LEGEND FOR LOGS AND TEST PITS FOR EXPLANATION OF SYMBOLS AND TERMS

IT ...Creating a Safer Tomorrow

BORING NO. S-801(1)

FIELD GEOLOGIST S. Hickey
EDITED BY H. Fleck
CHECKED BY T. Curran
TOTAL DEPTH 11 feet

COORDINATES N NA
E NA
DATE BEGAN 2-21-89
DATE FINISHED 2-21-89
GROUND SURFACE EL. NA

DEPTH IN FEET	SAMPLE TYPE & NUMBER HPA-	RECOVERY (in.)	P.I.D. READING (ppm)	WELL SUMMARY	BLOWS ON SAMPLER PER (6")	USCS	PROFILE	DESCRIPTION
0								SILTY SAND; medium brown, damp, loose, low plasticity, with roots and scattered gravels. (Fill)
								SILTY SAND; dark green to dark gray, moist, medium dense, slightly plastic, with abundant gravels (Serpentine) (Fill).
5	30	8/18				SM		SILTY SAND; medium brown to yellowish orange brown, damp, loose, non-plastic.
	31	6/18						
10								▽ Ground water encountered at 10.5' Petroleum odor at 10'
								TOTAL DEPTH 11 FEET
15								
20								
25								
30								
35								

DRILLING CO.: Exploration Geo Services
San Jose, California

DRILL METHOD: 6" Dia. Auger, 2"I.D. Split Spoon

PROJECT NO.: 409617.4.83
CLIENT: Martin Marietta Energy Systems
LOCATION: Hunter's Point Annex; Bldg. 811
San Francisco, California

801-1(*HP-1)

SEE LEGEND FOR LOGS AND TEST PITS
FOR EXPLANATION OF SYMBOLS AND TERMS

IT ...Creating a Safer Tomorrow

BORING NO. S-801(2)

FIELD GEOLOGIST S. Hickey
EDITED BY H. Fleck
CHECKED BY T. Curran
TOTAL DEPTH 12 feet

COORDINATES N NA
E NA
DATE BEGAN 2-21-89
DATE FINISHED 2-21-89
GROUND SURFACE EL. NA

DEPTH IN FEET	SAMPLE TYPE & NUMBER HPA-	RECOVERY (in.)	P.I.D. READING (ppm)	WELL SUMMARY	BLOWS ON SAMPLER PER (6")	USCS	PROFILE	DESCRIPTION
0								SILTY SAND; dark green to dark gray, damp, medium dense, slightly plastic, with abundant serpentinite gravels (Fill).
5	32	9/18				SM		SILTY SAND; yellowish orange brown (mottled) moist, medium dense, low to slight plasticity, with gravels.
	33	9/18						Gravels increase in size and abundance.
10								▽ Ground water encountered at 10.5' Diesel odor
15								TOTAL DEPTH 12 FEET Refusal
20								
25								
30								
35								

DRILLING CO.: Exploration Geo Services
San Jose, California

DRILL METHOD: 6" Dia. Auger, 2"I.D. Split Spoon

PROJECT NO.: 409617.4.83
CLIENT: Martin Marietta Energy Systems
LOCATION: Hunter's Point Annex; Bldg. 811
San Francisco, California

801-2(*HP1)

SEE LEGEND FOR LOGS AND TEST PITS
FOR EXPLANATION OF SYMBOLS AND TERMS

IT ...Creating a Safer Tomorrow

BORING NO. S-801(3)

FIELD GEOLOGIST S. Hickey
EDITED BY H. Fleck
CHECKED BY T. Curran
TOTAL DEPTH 10.5 feet

COORDINATES N NA
E NA
DATE BEGAN 2-21-89
DATE FINISHED 2-21-89
GROUND SURFACE EL. NA

DEPTH IN FEET	SAMPLE TYPE & NUMBER HPA-	RECOVERY (in.)	P.I.D. READING (ppm)	WELL SUMMARY	BLOWS ON SAMPLER PER (6")	USCS	PROFILE	DESCRIPTION
0						SP		GRAVELLY SAND; yellow brown to light gray, damp, medium dense, non-plastic.
5	34	14/18				SM		SILTY SAND; medium gray to dark gray, moist, medium dense, non-plastic.
10								▽ Ground water encountered at 9.5'
								TOTAL DEPTH 10.5 FEET
15								
20								
25								
30								
35								

DRILLING CO.: Exploration Geo Services
San Jose, California

DRILL METHOD: 6" Dia. Auger, 2"I.D. Split Spoon

PROJECT NO.: 409617.4.83
CLIENT: Martin Marietta Energy Systems
LOCATION: Hunter's Point Annex; Bldg. 811
San Francisco, California

801-3(*HP1)

SEE LEGEND FOR LOGS AND TEST PITS
FOR EXPLANATION OF SYMBOLS AND TERMS

IT ...Creating a Safer Tomorrow

BORING NO. S-801(4)

FIELD GEOLOGIST S. Hickey
EDITED BY H. Fleck
CHECKED BY T. Curran
TOTAL DEPTH 10 feet

COORDINATES N NA / E NA
DATE BEGAN 2-21-89
DATE FINISHED 2-21-89
GROUND SURFACE EL. NA

DEPTH IN FEET	SAMPLE TYPE & NUMBER HPA-	RECOVERY (in.)	P.I.D. READING (ppm)	WELL SUMMARY	BLOWS ON SAMPLER PER (6")	USCS	PROFILE	DESCRIPTION
0						GP		SANDY GRAVEL; medium brown to orange brown, damp, medium dense, non-plastic (Fill).
						SC		CLAYEY SAND; gray to dark gray, moist, medium dense, slightly plastic, with scattered gravels (Fill).
5	35	12/18				SM		SILTY SAND; pale green to dark green (mottled), damp, to moist, medium dense, slightly to non-plastic, with abundant serpentinite gravels (Fill).
						GW		SANDY GRAVEL; yellow brown to yellow orange, moist, medium dense to dense, non- to slightly plastic.
	36	15/18				SM		▽ SILTY SAND; greenish gray, very wet, loose, non-plastic. ▽ Ground water encountered at 9.5'
10								TOTAL DEPTH 10 FEET
15								
20								
25								
30								
35								

DRILLING CO.: Exploration Geo Services
San Jose, California

DRILL METHOD: 6" Dia. Auger, 2"I.D. Split Spoon

PROJECT NO.: 409617.4.83
CLIENT: Martin Marietta Energy Systems
LOCATION: Hunter's Point Annex; Bldg. 811
San Francisco, California

801-4(*HP1)

SEE LEGEND FOR LOGS AND TEST PITS
FOR EXPLANATION OF SYMBOLS AND TERMS

IT ...Creating a Safer Tomorrow

BORING NO. S-812(1)

FIELD GEOLOGIST S. Hickey
EDITED BY H. Fleck
CHECKED BY T. Curran
TOTAL DEPTH 5 feet

COORDINATES N NA
E NA
DATE BEGAN 2-22-89
DATE FINISHED 2-22-89
GROUND SURFACE EL. NA

DEPTH IN FEET	SAMPLE TYPE & NUMBER HPA-	RECOVERY (in.)	P.I.D. READING (ppm)	WELL SUMMARY	BLOWS ON SAMPLER PER (6")	USCS	PROFILE	DESCRIPTION
0								4" Asphalt
						GW		SANDY GRAVEL; medium gray, dense, non-plastic (Fill).
						SM		SILTY SAND; medium brown to gray, moist, saturated below 4 ft., medium dense, non-plastic (Fill).
								▽Ground water encountered at 4 ft..
5						CL		SANDY CLAY; greenish gray to dark gray, saturated, medium stiff, moderately plastic.
								TOTAL DEPTH 5 FEET
								No odor or sign of contamination
10								
15								
20								
25								
30								
35								

Notes:
1) Appears to be back-fill of trench line.
2) No samples collected.

DRILLING CO.: Exploration Geo Services
San Jose, California

DRILL METHOD: 6" Dia. Auger, 2"I.D. Split Spoon

PROJECT NO.: 409617.4.83
CLIENT: Martin Marietta Energy Systems
LOCATION: Hunter's Point Annex; Bldg. 813
San Francisco, California

812-1(*HP1)

SEE LEGEND FOR LOGS AND TEST PITS
FOR EXPLANATION OF SYMBOLS AND TERMS

IT ...Creating a Safer Tomorrow

BORING NO. S-812(2)

FIELD GEOLOGIST S. Hickey
EDITED BY H. Fleck
CHECKED BY T. Curran
TOTAL DEPTH 10 feet

COORDINATES N NA
E NA
DATE BEGAN 2-22-89
DATE FINISHED 2-22-89
GROUND SURFACE EL. NA

DEPTH IN FEET	SAMPLE TYPE & NUMBER HPA-	RECOVERY (in.)	P.I.D. READING (ppm)	WELL SUMMARY	BLOWS ON SAMPLER PER (6")	USCS	PROFILE	DESCRIPTION
0								4" Asphalt
						GW		SANDY GRAVEL; medium brown to gray, moist, dense, non-plastic (Fill).
						SC		CLAYEY SAND; greenish gray, moist, medium dense to dense, slightly plastic, with abundant fragments of serpentinite.
	37	12/18				GM		SANDY GRAVEL; greenish gray to dark gray, moist to wet, dense, non-plastic. (deeply weathered serpentinite, shale and greenstone).
5								▽ Ground water encountered at 5 ft..
								KJfs; Dark gray to greenish gray, massive, closely to intensely fractured, low hardness, moderately weathered. (Predominantly sandstone and sepentinite) Dry below 7' with wet fracture surfaces.
10								TOTAL DEPTH 10 FEET
15								
20								
25								
30								
35								

DRILLING CO.: Exploration Geo Services
San Jose, California

DRILL METHOD: 6" Dia. Auger, 2"I.D. Split Spoon

PROJECT NO.: 409617.4.83
CLIENT: Martin Marietta Energy Systems
LOCATION: Hunter's Point Annex; Bldg. 813
San Francisco, California

812-2(*HP1)

SEE LEGEND FOR LOGS AND TEST PITS
FOR EXPLANATION OF SYMBOLS AND TERMS

IT ...Creating a Safer Tomorrow

APPENDIX D – LABORATORY ANALYSIS REPORTS

TECHNICAL REPORT UNDERGROUND TANK INVESTIGATION

DATED 7 DECEMBER 1989

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

17605 Fabrica Way • Cerritos, California 90701 • 213-921-9831 / 714-523-9200

CERTIFICATE OF ANALYSIS

Prepared for:
IT Corporation
4585 Pacheco Blvd.
Martinez, CA 94553

Attn: John McGuire

Date: September 14, 1988

Date Received: August 6, 1988

P.O. Number 409617-3-83
Hunters Point

Job Number 47684/sds

Sixteen (16) liquid samples labeled:

"HPA-1,"	"HPA-2,"	"HPA-3,"	"HPA-4,"
"HPA-5,"	"HPA-6,"	"HPA-7,"	"HPA-8,"
"HPA-9,"	"HPA-10,"	"HPA-11,"	"HPA-12,"
"HPA-13,"	"HPA-14,"	"HPA-15,"	"HPA-16"

The samples were analyzed for Volatile Organic Compounds by gas chromatograph/mass spectroscopy according to EPA, CLP protocol. Results are reported in Tables I-A and I-B.

The samples were analyzed for semi-volatile and volatile fuel hydrocarbons on a Varian 3700 gas chromatograph equipped with a flame ionization detector. Diesel fuel #2, paint thinner, crude oil and leaded gasoline were used as calibration standards. The results are listed on Table II.

Tentatively identified volatile compounds are summarized in Table III.

Surrogate recoveries for volatile samples are summarized in Table IV.

I certify that this report truly represents the finding of work performed by me or under my direct supervision.

Cheryl Suhl for

Guy Sylvester
Special Projects Manager

Reviewed and Approved

Ken Faust
Technical Director

Table I-A

Parameter: Volatiles
Matrix: Soil

Method: CLP
Units: ug/Kg

Analyte	Detection Limit	VBLK 1	HPA-4
Chloromethane	1000	ND	ND
Bromomethane	1000	ND	ND
Vinyl Chloride	1000	ND	ND
Chloroethane	1000	ND	ND
Methylene Chloride	500	2000	1500
Acetone	1000	ND	1800
Carbon Disulfide	500	ND	ND
1,1-Dichloroethene	500	ND	ND
1,1-Dichloroethane	500	ND	ND
1,2-Dichloroethene (total)	500	ND	ND
Chloroform	500	ND	ND
1,2-Dichloroethane	500	ND	ND
2-Butanone	1000	ND	ND
1,1,1-Trichloroethane	500	ND	ND
Carbon Tetrachloride	500	ND	ND
Vinyl Acetate	1000	ND	ND
Bromodichloromethane	500	ND	ND
1,2-Dichloropropane	500	ND	ND
Cis-1,3-Dichloropropene	500	ND	ND
Trichloroethene	500	ND	ND
Dibromochloromethane	500	ND	ND
1,1,2-Trichloroethane	500	ND	ND
Benzene	500	ND	700
Trans-1,3-Dichloropropene	500	ND	ND
Bromoform	500	ND	ND
4-Methyl-2-Pentanone	1000	ND	ND
2-Hexanone	1000	ND	ND
Tetrachloroethene	500	ND	ND
1,1,2,2-tetrachloroethane	1000	ND	ND
Toluene	500	ND	2100
Chlorobenzene	500	ND	ND
Ethylbenzene	500	ND	ND
Styrene	500	ND	ND
Xylenes (total)	500	ND	ND

ND - The analyte was not detected at or above the stated detection limit.

Table I-B

Parameter: Volatiles
Matrix: Water

Method: CLP
Units: ug/L

Analyte	Detection Limit	VBLK 2	HPA-7	HPA-8	HPA-13
Chloromethane	10	ND	ND<1000	ND<200	ND
Bromomethane	10	ND	ND<1000	ND<200	ND
Vinyl Chloride	10	ND	ND<1000	ND<200	ND
Chloroethane	10	ND	ND<1000	ND<200	ND
Methylene Chloride	5	8	1300	440	12
Acetone	10	ND	ND<1000	ND<200	29
Carbon Disulfide	5	ND	ND<500	ND<100	ND
1,1-Dichloroethene	5	ND	ND<500	ND<100	ND
1,1-Dichloroethane	5	ND	ND<500	ND<100	ND
1,2-Dichloroethene (total)	5	ND	ND<500	ND<100	ND
Chloroform	5	ND	ND<500	ND<100	7
1,2-Dichloroethane	5	ND	ND<500	ND<100	ND
utanone	10	ND	ND<1000	ND<200	ND
1,1,1-Trichloroethane	5	ND	ND<500	ND<100	ND
Carbon Tetrachloride	5	ND	ND<500	ND<100	ND
Vinyl Acetate	5	ND	ND<1000	ND<200	ND
Bromodichloromethane	5	ND	ND<500	ND<100	ND
1,2-Dichloropropane	5	ND	ND<500	ND<100	ND
Cis-1,3-Dichloropropene	5	ND	ND<500	ND<100	ND
Trichloroethene	5	ND	ND<500	ND<100	ND
Dibromochloromethane	5	ND	ND<500	ND<100	ND
1,1,2-Trichloroethane	5	ND	ND<500	ND<100	ND
Benzene	5	ND	4700	ND<100	ND
Trans-1,3-Dichloropropene	5	ND	ND<500	ND<100	ND
Bromoform	5	ND	ND<500	ND<100	ND
4-Methyl-2-Pentanone	10	ND	ND<1000	ND<200	ND
2-Hexanone	10	ND	ND<1000	ND<200	ND
Tetrachloroethene	5	ND	ND<500	ND<100	ND
1,1,2,2-tetrachloroethane	10	ND	ND<1000	ND<200	ND
Toluene	5	ND	15000	ND<100	40
Chlorobenzene	5	ND	ND<500	ND<100	ND
Ethylbenzene	5	ND	640	ND<100	10
Styrene	5	ND	ND<500	ND<100	ND
Xylenes (total)	5	ND	18000	3500	340

ND - The analyte was not detected at or above the stated detection limit.

Table I-B
(Continued)

Parameter: Volatiles
Matrix: Water

Method: CLP
Units: ug/L

Analyte	Detection Limit	VBLK 3	HPA-10	HPA-14
Chloromethane	1000	ND	ND	ND<100
Bromomethane	1000	ND	ND	ND<100
Vinyl Chloride	1000	ND	ND	ND>100
Chloroethane	1000	ND	ND	ND<100
Methylene Chloride	500	12	7	130
Acetone	1000	ND	ND	130
Carbon Disulfide	500	ND	ND	ND<50
1,1-Dichloroethene	500	ND	ND	ND<50
1,1-Dichloroethane	500	ND	ND	ND<50
1,2-Dichloroethene (total)	500	ND	ND	ND<50
Chloroform	500	ND	ND	ND<50
1,2-Dichloroethane	500	ND	ND	ND<50
2-Butanone	1000	ND	ND	ND<100
1,1,1-Trichloroethane	500	ND	ND	ND<50
Carbon Tetrachloride	500	ND	ND	ND<50
Vinyl Acetate	1000	ND	ND	ND<100
Bromodichloromethane	500	ND	ND	ND<50
1,2-Dichloropropane	500	ND	ND	ND<50
Cis-1,3-Dichloropropene	500	ND	ND	ND<50
Trichloroethene	500	ND	ND	ND<50
Dibromochloromethane	500	ND	ND	ND<50
1,1,2-Trichloroethane	500	ND	ND	ND<50
Benzene	500	ND	ND	ND<50
Trans-1,3-Dichloropropene	500	ND	ND	ND<50
Bromoform	500	ND	ND	ND<50
4-Methyl-2-Pentanone	1000	ND	ND	ND<100
2-Hexanone	1000	ND	ND	ND<100
Tetrachloroethene	500	ND	ND	ND<50
1,1,2,2-tetrachloroethane	1000	ND	ND	ND<100
Toluene	500	ND	8	450
Chlorobenzene	500	ND	ND	ND<50
Ethylbenzene	500	ND	ND	ND<50
Styrene	500	ND	ND	ND<50
Xylenes (total)	500	ND	20	2300

ND - The analyte was not detected at or above the stated detection limit.

Table II

Analytical Results for Hunters Point

Sample ID	Milligrams Per Liter
	Semi-Volatile and Volatile Fuel Hydrocarbons
HPA-1	760000
HPA-2	>950000
HPA-3	860000
**HPA-4	ND<50
HPA-5	400000
HPA-6	560000
**HPA-7	3.5
**HPA-8	120
HPA-9	940000*
HPA-10	ND<0.5
HPA-11	640000
HPA-12	66
**HPA-13	ND<0.5
HPA-14	40
HPA-15	950000*
HPA-16	410000

*Milligrams Per Kilogram, sample was measured by weight.

**GC/MS analysis was performed on the sample.

ND - The analyte was not detected at or above the stated detection limit.

Table III

Tentatively Identified Volatile Compounds

Sample ID	Compound	Estimated Conc. (ug/L)
HPA-7	Cyclohexane	2000
	Methylcyclopentane	1000
HPA-8	Branched cyclohexane	400
	Unknown	180
	Ethylmethyl cyclohexane isomer	180
HPA-13	Branched cyclohexane	9
	Ethylmethylcyclohexane isomer	6

Table IV

Volatile Surrogate Recovery
for
Hunter's Point

Sample ID	Percent Recovery		
	(TOL)	(BFB)	(DCE)
HPA-4	99	99	101
VBLK-1	100	101	97
HPA-10	99	93	99
HPA-13	99	105	97
HPA-14	100	96	97
HPA-7	100	100	97
HPA-8	105	108	94
VBLK-2	98	100	96
VBLK-3	99	94	95
QC Limits			
(TOL) = Toluene - d8		(88-110)	
(BFB) = Bromofluorobenzene (86-115)		(86-115)	
(DCE) = 1,2-Dichloroethane-d4 (76-114)		(76-114)	

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

17605 Fabrica Way • Cerritos, California 90701 • 213-921-9831 / 714-523-9200

CERTIFICATE OF ANALYSIS

Prepared for: IT Corporation
4585 Pacheco Blvd.
Martinez, CA 94553

Attn: John McGuire

Date: December 2, 1988

Date Received: November 15, 1988 P.O. Number 409617.3.83 Hunters Pt. Job Number 49350/sds

One (1) liquid sample labeled: "HPA-26"

The sample was extracted with hexane and analyzed for high boiling fuel hydrocarbons by direct injection into a Varian 3700 gas chromatograph equipped with a flame ionization detector. Diesel #2 used as the calibration standard. The result is listed below.

	Micrograms Per Liter
Sample ID	High Boiling Fuel Hydrocarbons
HPA-26	46000

Reviewed and Approved

Cheryl Suhl
Project Manager

Reviewed and Approved

Ken Faust
Technical Director

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

17605 Fabrica Way • Cerritos, California 90701 • 213-921-9831 / 714-523-9200

CERTIFICATE OF ANALYSIS

Prepared for: IT Corporation
4585 Pacheco Boulevard
Martinez, CA 94553

Attn: Mr. John McGuire

Date: March 9, 1989

Date Received: February 23, 1989 P.O. Number 409617-4-83 Hunters Point Job Number 50674/dk

REPORT SUMMARY

Fifteen (15) solid samples labeled as follows:

Job No. 50674:	Job No. 50679:
HPA-37	HPA-27
HPA-38	HPA-28
HPA-39	HPA-29
HPA-40	HPA-30
HPA-41	HPA-31
	HPA-32
	HPA-33
	HPA-34
	HPA-35
	HPA-36

The samples were extracted with hexane and analyzed for High Boiling Fuel Hydrocarbons by direct injection into a gas chromatograph equipped with a flame ionization detector. Diesel Fuel #2 was used as the calibration standard. In addition, Motor Oil was used as a calibration standard for samples "HPA-27" and "HPA-29". The results are listed in Table I.

Quality Control data is listed in Table II.

Reviewed and Approved

Donna Kozak

Donna Kozak
Project Manager

Reviewed and Approved

Cheryl Ferguson for

Ken Faust
Technical Director

Table I

Summary of High Boiling Fuel Hydrocarbons Analyses
for Hunters Point
Project No. 409617-4-83

Matrix: Solid
Detection Limit: 50
Units: Milligrams Per Kilogram
Date Analyzed: February 27-28, 1989

Sample ID	Diesel #2	Motor Oil
HPA-27	ND	90
HPA-28	ND	NA
HPA-29	170	480
HPA-30	ND	NA
HPA-31	160	NA
HPA-32	ND	NA
HPA-33	ND	NA
HPA-34	ND	NA
HPA-35	ND	NA
HPA-36	ND	NA
HPA-37	ND	NA
HPA-38	ND	NA
HPA-39	ND	NA
HPA-40	ND	NA
HPA-41	ND	NA

NA - The calibration standard was not used for this sample.
ND - The analyte was not detected at or above the stated detection limit.

Table II

Quality Control Summary (MS/MSD)
for Hunters Point
Project No. 409617-4-83

Matrix: Solid
Units: Milligrams Per Kilogram
Sample ID: HPA-37

Analyte	Conc. Sample	Amt. Spiked	Conc. MS	% Rec. MS	Conc. MSD	% Rec. MSD	RPD
High Boiling Fuel Hydrocarbons	ND<50	1010	930	92	934	93	0

MS - Matrix Spike
MSD - Matrix Spike Duplicate
ND - The analyte was not detected at or above the stated detection limit.
RPD - Relative Percent Difference (Difference/Average x100)

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

17605 Fabrica Way • Cerritos, California 90701 • 213-921-9831 / 714-523-9200

CERTIFICATE OF ANALYSIS

Prepared for: IT Corporation
4585 Pacheco Boulevard
Martinez, CA 94553

Attn: Mr. John McGuire

Date: March 27, 1989

Date Received: February 23, 1989 P.O. Number 409617-4-83 Hunters Point Job Number 50898/dk

REPORT SUMMARY

Two (2) soil samples labeled as follows:

Job No. 50674: HPA-38
HPA-39

The samples were analyzed for Total Petroleum Hydrocarbons, at the client's request, according to EPA method 418.1 using infrared spectrophotometry. The results are listed in Table I.

Reviewed and Approved

Donna Kozak

Donna Kozak
Project Manager

Reviewed and Approved

Cheryl Ferguson for

Ken Faust
Technical Director

Table I

Summary of Total Petroleum Hydrocarbons
for Hunters Point
Project No. 409617-4-83

Matrix: Solid
Detection Limit: 1
Units: Milligrams Per Kilogram
Date Analyzed: March 16, 1989

Sample ID	Total Petroleum Hydrocarbons
HPA-38	120
HPA-39	4

IT Analytical Services
Progress Report
for
Naval Station Treasure Island
Hunters Point Annex
Project No. 409617-4-83

1st Quarter 1989

Hunters Point
1st Quarter

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I Summary of Samples Received

Chain of Custody Records
Requests for Analysis
Analytical Status Report

50674

INTERNATIONAL TECHNOLOGY CORPORATION

CHAIN-OF-CUSTODY RECORD

R/A Control No. B94888

C/C Control No. A 90646

PROJECT NAME/NUMBER HUNTERS POINT / 409612-4-83

LAB DESTINATION CERRITOS

SAMPLE TEAM MEMBERS DERRICK WILLIAMS S.J. HICKEY

CARRIER/WAYBILL NO. 280678230 0

Sample Number	Sample Location and Description	Date and Time Collected	Sample Type	Container Type	Condition on Receipt (Name and Date)	Disposal Record No.
HPA-37	S-812(2) @ 3'	2-22-89/9:00	SOIL	BRASS TUBE	On Intact	
HPA-38	S-209(1) @ 5'	11:00				
HPA-39	S-209(2) @ 5'	11:35				
HPA-40	S-209(2) @ 6'	11:45				
HPA-41	S-213(2) @ 5'	12:30				

Special Instructions: NONE

Possible Sample Hazards: NONE

SIGNATURES: (Name, Company, Date and Time)

1. Relinquished By: Steph J Hick, IT, 2-22-89 15:00

   Received By: Julie Manson, IT Cer, 2-23-89 1150

2. Relinquished By: _____

   Received By: _____

3. Relinquished By: _____

   Received by: _____

4. Relinquished By: _____

   Received By: _____

WHITE - To accompany samples
YELLOW - Field copy

00675

INTERNATIONAL TECHNOLOGY CORPORATION

CHAIN-OF-CUSTODY RECORD

R/A Control No. B-94892

C/C Control No. A 9005

PROJECT NAME/NUMBER HUNTERS POINT / 409617-4-83

LAB DESTINATION Cerritos CA 13

SAMPLE TEAM MEMBERS DERRICK WILLIAMS, STEPHEN J. HICHEY

CARRIER/WAYBILL NO. 2806782 0852 | FED. EX.

Sample Number	Sample Location and Description	Date and Time Collected	Sample Type	Container Type	Condition on Receipt (Name and Date)	Disposal Record No.
HPA-27	S-508(1) @ 4'	2-21-89/1115	SOIL	BRASS TUBE	JM Intact 2/23	
HPA-28	S-508(2) @ 6'	1150				
HPA-29	S-214(1) @ 5'	1245				
HPA-30	S-801(1) @ 5'	1450				
HPA-31	S-801(1) @ 8'	1500				
HPA-32	S-801(2) @ 5'	1515				
HPA-33	S-801(2) @ 8'	1520				
HPA-34	S-801(3) @ 5'	1540				
HPA-35	S-801(4) @ 5'	1600				
HPA-36	S-801(4) @ 8'	1610				

Special Instructions: —

Possible Sample Hazards: NONE

SIGNATURES: (Name, Company, Date and Time)

1. Relinquished By: Keith J Riley IT 2-22-89

   Received By: Julie Manatu; ITCor; 2-23-89 1520

2. Relinquished By: _____

   Received By: _____

3. Relinquished By: _____

   Received by: _____

4. Relinquished By: _____

   Received By: _____

WHITE - To accompany samples
YELLOW - Field copy

50898 50674

INTERNATIONAL TECHNOLOGY CORPORATION

CHAIN-OF-CUSTODY RECORD

R/A Control No. B94888

C/C Control No. A 90646

PROJECT NAME/NUMBER HUNTERS POINT / 409617-4-83

LAB DESTINATION CERRITOS

SAMPLE TEAM MEMBERS DERRICK WILLIAMS S.J. HICKEY

CARRIER/WAYBILL NO. 280678230 0

Sample Number	Sample Location and Description	Date and Time Collected	Sample Type	Container Type	Condition on Receipt (Name and Date)	Disposal Record No.
HPA-37	S-812 (2) @ 3'	2-22-89/9:00	SOIL	BRASS TUBE	Intact	
HPA-38	S-209 (1) @ 5'	11:00	↓	↓	↓	
HPA-39	S-209 (2) @ 5'	11:35				
HPA-40	S-209 (2) @ 6'	11:45				
HPA-41	S-213 (2) @ 5'	12:30	↓	↓	↓	

Special Instructions: NONE

Possible Sample Hazards: NONE

SIGNATURES: (Name, Company, Date and Time)

1. Relinquished By: Stephen J Hickey, IT, 2-22-89 15:00

   Received By: Julie Manson, IT Cer, 2-23-89 1150

2. Relinquished By: _____

   Received By: _____

3. Relinquished By: _____

   Received by: _____

4. Relinquished By: _____

   Received By: _____

WHITE - To accompany samples
YELLOW - Field copy

50674

INTERNATIONAL TECHNOLOGY CORPORATION

REQUEST FOR ANALYSIS

R/A Control No. B 94388
C/C Control No. A 90646

PROJECT NAME: HUNTERS POINT
PROJECT NUMBER: 409617-4-83
PROJECT MANAGER: JOHN MCGUIRE
BILL TO: IT ENGINEERING MARTINEZ, CALIF.
PURCHASE ORDER NO.: 409617-4-83

DATE SAMPLES SHIPPED: 2-22-88
LAB DESTINATION: CERRITOS
LABORATORY CONTACT: JENNIFER
SEND LAB REPORT TO: J. MCGUIRE IT ENGR MARTINER
DATE REPORT REQUIRED:
PROJECT CONTACT: J. MCGUIRE
PROJECT CONTACT PHONE NO.: 415-372-9100

Sample No.	Sample Type	Sample Volume	Preservative	Requested Testing Program	Special Instructions
HPA-37	SOIL	2"x6" TUBE	COLD	HIGH BOILING TPH -DIESEL -FUEL OIL	TAKE SAMPLE FROM MIDDLE OF TUBE
HPA-38	↓	↓	↓	↓	↓
HPA-39	↓	↓	↓	↓	↓
HPA-40	↓	↓	↓	↓	↓
HPA-41	↓	↓	↓	↓	↓

TURNAROUND TIME REQUIRED: (Rush must be approved by the Project Manager.)

Normal X Rush _____ (Subject to rush surcharge)

POSSIBLE HAZARD IDENTIFICATION: (Please indicate if sample(s) are hazardous materials and/or suspected to contain high levels of hazardous substances)

Nonhazard X Flammable _____ Skin Irritant _____ Highly Toxic _____ Other _____ (Please Specify)

SAMPLE DISPOSAL: (Please indicate disposition of sample following analysis. Lab will charge for packing, shipping, and disposal.)

Return to Client _____ Disposal by Lab X

FOR LAB USE ONLY

Received By Julie Manson Date/Time 2-23-89 1150

WHITE - Original, to accompany samples
YELLOW - Field copy

INTERNATIONAL TECHNOLOGY CORPORATION

50679

REQUEST FOR ANALYSIS

R/A Control No. B 94892

C/C Control No. A906 45-

PROJECT NAME: HUNTERS POINT

PROJECT NUMBER: 409617-4-83

PROJECT MANAGER: JOHN MCGUIRE

BILL TO: IT MARTINEZ ENGINEERING

PURCHASE ORDER NO.: 409617-4-83

DATE SAMPLES SHIPPED: 2-22-89

LAB DESTINATION: Cerritos ~~S.F.O.~~ LAB

LABORATORY CONTACT: DONNA KOZACK

SEND LAB REPORT TO: JOHN MCGUIRE MARTINEZ (IT) ENGINEERING

DATE REPORT REQUIRED:

PROJECT CONTACT: J. MCGUIRE

PROJECT CONTACT PHONE NO.: 415-372-9100

Sample No.	Sample Type	Sample Volume	Preservative	Requested Testing Program	Special Instructions
HPA-27	SOIL	6"x2" TUBE	COLD	TPH HIGH BOILING (DIESEL & FUEL OIL)	TAKE SAMPLE FROM MIDDLE OF TUBE
HPA-28	↓	↓	↓	↓	↓
HPA-29					
HPA-30					
HPA-31					
HPA-32					
HPA-33					
HPA-34					
HPA-35					
HPA-36	↓	↓	↓	↓	↓

TURNAROUND TIME REQUIRED: (Rush must be approved by the Project Manager.)

Normal X Rush _____ (Subject to rush surcharge)

POSSIBLE HAZARD IDENTIFICATION: (Please indicate if sample(s) are hazardous materials and/or suspected to contain high levels of hazardous substances)

Nonhazard X Flammable _____ Skin Irritant _____ Highly Toxic _____ Other _____ (Please Specify)

SAMPLE DISPOSAL: (Please indicate disposition of sample following analysis. Lab will charge for packing, shipping, and disposal.)

Return to Client _____ Disposal by Lab X

FOR LAB USE ONLY

Received By Julio Manson Date/Time 2-23-89 1520

WHITE - Original, to accompany samples
YELLOW - Field copy

8

INTERNATIONAL TECHNOLOGY CORPORATION

50898 50674

REQUEST FOR ANALYSIS

R/A Control No. B 94888
C/C Control No. A 90646

PROJECT NAME: HUNTERS POINT
PROJECT NUMBER: 409617-4-83
PROJECT MANAGER: JOHN MCGUIRE
BILL TO: IT ENGINEERING
MARTINEZ, CALIF.

PURCHASE ORDER NO.: 409617-4-83

DATE SAMPLES SHIPPED: 2-22-88
LAB DESTINATION: CERRITOS
LABORATORY CONTACT: JENNIFER
SEND LAB REPORT TO: J. MCGUIRE
IT ENGR
MARTINER

DATE REPORT REQUIRED:
PROJECT CONTACT: J. MCGUIRE
PROJECT CONTACT PHONE NO.: 415-372-9100

Sample No.	Sample Type	Sample Volume	Preservative	Requested Testing Program	Special Instructions
HPA-37	SOIL	2"x6" TUBE	COLD	HIGH BOILING TPH -DIESEL -FUEL OIL	TAKE SAMPLE FROM MIDDLE OF TUBE
HPA-38	↓	↓	↓	↓	↓
HPA-39					
HPA-40					
HPA-41					
				ADDITIONAL TEST REQUESTED	
				FOR #38 & 39	
				ANALYZE FOR 418.1	

TURNAROUND TIME REQUIRED: (Rush must be approved by the Project Manager.)

Normal X Rush _____ (Subject to rush surcharge)

POSSIBLE HAZARD IDENTIFICATION: (Please indicate if sample(s) are hazardous materials and/or suspected to contain high levels of hazardous substances)

Nonhazard X Flammable _____ Skin Irritant _____ Highly Toxic _____ Other _____ (Please Specify)

SAMPLE DISPOSAL: (Please indicate disposition of sample following analysis. Lab will charge for packing, shipping, and disposal.)

Return to Client _____ Disposal by Lab X

FOR LAB USE ONLY

Received By Julie Monson Date/Time 2-23-89 1150

WHITE - Original, to accompany samples
YELLOW - Field copy

HUNTERS POINT

JOB #/ID	CUST SPL #	DATE REC'D	TPH	418.1
50674 1	HPA-37	2/23/89	(X)SI	
50674 2	HPA-38	2/23/89	(X)SI	
50674 3	HPA-39	2/23/89	(X)SI	
50674 4	HPA-40	2/23/89	(X)SI	
50674 5	HPA-41	2/23/89	(X)SI	
50679 1	HPA-27	2/23/89	(X)SI	
50679 2	HPA-28	2/23/89	(X)SI	
50679 3	HPA-29	2/23/89	(X)SI	
50679 4	HPA-30	2/23/89	(X)SI	
50679 5	HPA-31	2/23/89	(X)SI	
50679 6	HPA-32	2/23/89	(X)SI	
50679 7	HPA-33	2/23/89	(X)SI	
50679 8	HPA-34	2/23/89	(X)SI	
50679 9	HPA-35	2/23/89	(X)SI	
50679 10	HPA-36	2/23/89	(X)SI	
50898 1	HPA-38	2/23/89		(X)SI
50898 2	HPA-39	2/23/89		(X)SI

/ = ANALYSIS REQUIRED S = RESULTS SENT OUT
X = ANALYSIS COMPLETE I = ANALYSIS INVOICED
(X) = RESULTS REVIEWED/TURNED IN TO PROJECT MGMT

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II Analytical Results

Certificates of Analysis
(includes QC Sample Results)

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

17605 Fabrica Way • Cerritos, California 90701 • 213-921-9831 / 714-523-9200

CERTIFICATE OF ANALYSIS

Prepared for: IT Corporation
4585 Pacheco Boulevard
Martinez, CA 94553

Attn: Mr. John McGuire

Date: March 9, 1989

Date Received: February 23, 1989 P.O. Number 409617-4-83
Hunters Point

Job Number 50674/dk

REPORT SUMMARY

Fifteen (15) solid samples labeled as follows:

Job No. 50674:	Job No. 50679:
HPA-37	HPA-27
HPA-38	HPA-28
HPA-39	HPA-29
HPA-40	HPA-30
HPA-41	HPA-31
	HPA-32
	HPA-33
	HPA-34
	HPA-35
	HPA-36

The samples were extracted with hexane and analyzed for High Boiling Fuel Hydrocarbons by direct injection into a gas chromatograph equipped with a flame ionization detector. Diesel Fuel #2 was used as the calibration standard. In addition, Motor Oil was used as a calibration standard for samples "HPA-27" and "HPA-29". The results are listed in Table I.

Quality Control data is listed in Table II.

Reviewed and Approved
Donna Kozak
Donna Kozak
Project Manager

Reviewed and Approved
Cheryl Ferguson for
Ken Faust
Technical Director

Table I

Summary of High Boiling Fuel Hydrocarbons Analyses
for Hunters Point
Project No. 409617-4-83

Matrix: Solid
Detection Limit: 50
Units: Milligrams Per Kilogram
Date Analyzed: February 27-28, 1989

Sample ID	Diesel #2	Motor Oil
HPA-27	ND	90
HPA-28	ND	NA
HPA-29	170	480
HPA-30	ND	NA
HPA-31	160	NA
HPA-32	ND	NA
HPA-33	ND	NA
HPA-34	ND	NA
HPA-35	ND	NA
HPA-36	ND	NA
HPA-37	ND	NA
HPA-38	ND	NA
HPA-39	ND	NA
HPA-40	ND	NA
HPA-41	ND	NA

NA - The calibration standard was not used for this sample.
ND - The analyte was not detected at or above the stated detection limit.

Table II

Quality Control Summary (MS/MSD)
for Hunters Point
Project No. 409617-4-83

Matrix: Solid
Units: Milligrams Per Kilogram
Sample ID: HPA-37

Analyte	Conc. Sample	Amt. Spiked	Conc. MS	% Rec. MS	Conc. MSD	% Rec. MSD	RPD
High Boiling Fuel Hydrocarbons	ND<50	1010	930	92	934	93	0

MS - Matrix Spike
MSD - Matrix Spike Duplicate
ND - The analyte was not detected at or above the stated detection limit.
RPD - Relative Percent Difference (Difference/Average x100)

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The following Certificate of Analysis is for additional analyses requested by the client, for informational purposes only.

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

17605 Fabrica Way • Cerritos, California 90701 • 213-921-9831 / 714-523-9200

CERTIFICATE OF ANALYSIS

Prepared for: IT Corporation
4585 Pacheco Boulevard
Martinez, CA 94553

Attn: Mr. John McGuire

Date: March 27, 1989

Date Received: February 23, 1989 P.O. Number 409617-4-83 Hunters Point Job Number 50898/dk

REPORT SUMMARY

Two (2) soil samples labeled as follows:

Job No. 50674: HPA-38
HPA-39

The samples were analyzed for Total Petroleum Hydrocarbons, at the client's request, according to EPA method 418.1 using infrared spectrophotometry. The results are listed in Table I.

Reviewed and Approved

Donna Kozak

Donna Kozak
Project Manager

Reviewed and Approved

Ken Faust
Technical Director

Table I

Summary of Total Petroleum Hydrocarbons
for Hunters Point
Project No. 409617-4-83

Matrix: Solid
Detection Limit: 1
Units: Milligrams Per Kilogram
Date Analyzed: March 16, 1989

Sample ID	Total Petroleum Hydrocarbons
HPA-38	120
HPA-39	4

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III Quality Control Data

QC Sample Results
(from Certificates of Analysis)
Summary of Non-CLP Acceptance Criteria
Control Charts

Table II

Quality Control Summary (MS/MSD)
for Hunters Point
Project No. 409617-4-83

Matrix: Solid
Units: Milligrams Per Kilogram
Sample ID: HPA-37

Analyte	Conc. Sample	Amt. Spiked	Conc. MS	% Rec. MS	Conc. MSD	% Rec. MSD	RPD
High Boiling Fuel Hydrocarbons	ND<50	1010	930	92	934	93	0

MS - Matrix Spike
MSD - Matrix Spike Duplicate
ND - The analyte was not detected at or above the stated detection limit.
RPD - Relative Percent Difference (Difference/Average x100)

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Non-CLP Acceptance Criteria *

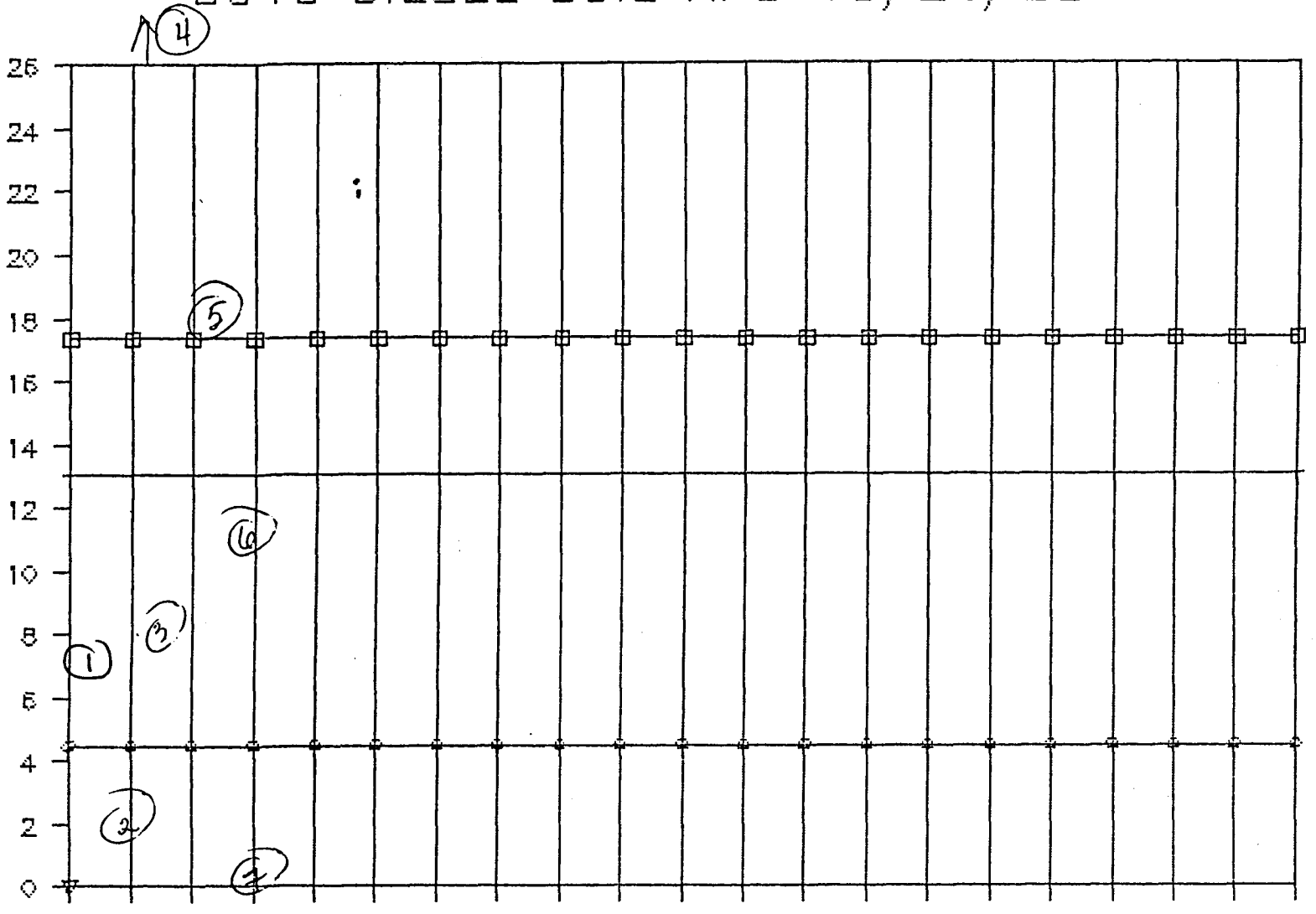
Matrix Spike/Matrix Spike Duplicate QC Limits

Method	Compound	RPD Limits	Recovery Limits
Modified 8015 (Soils)	Diesel	<17	80 - 124

RPD - Relative Percent Difference (Difference/Average)

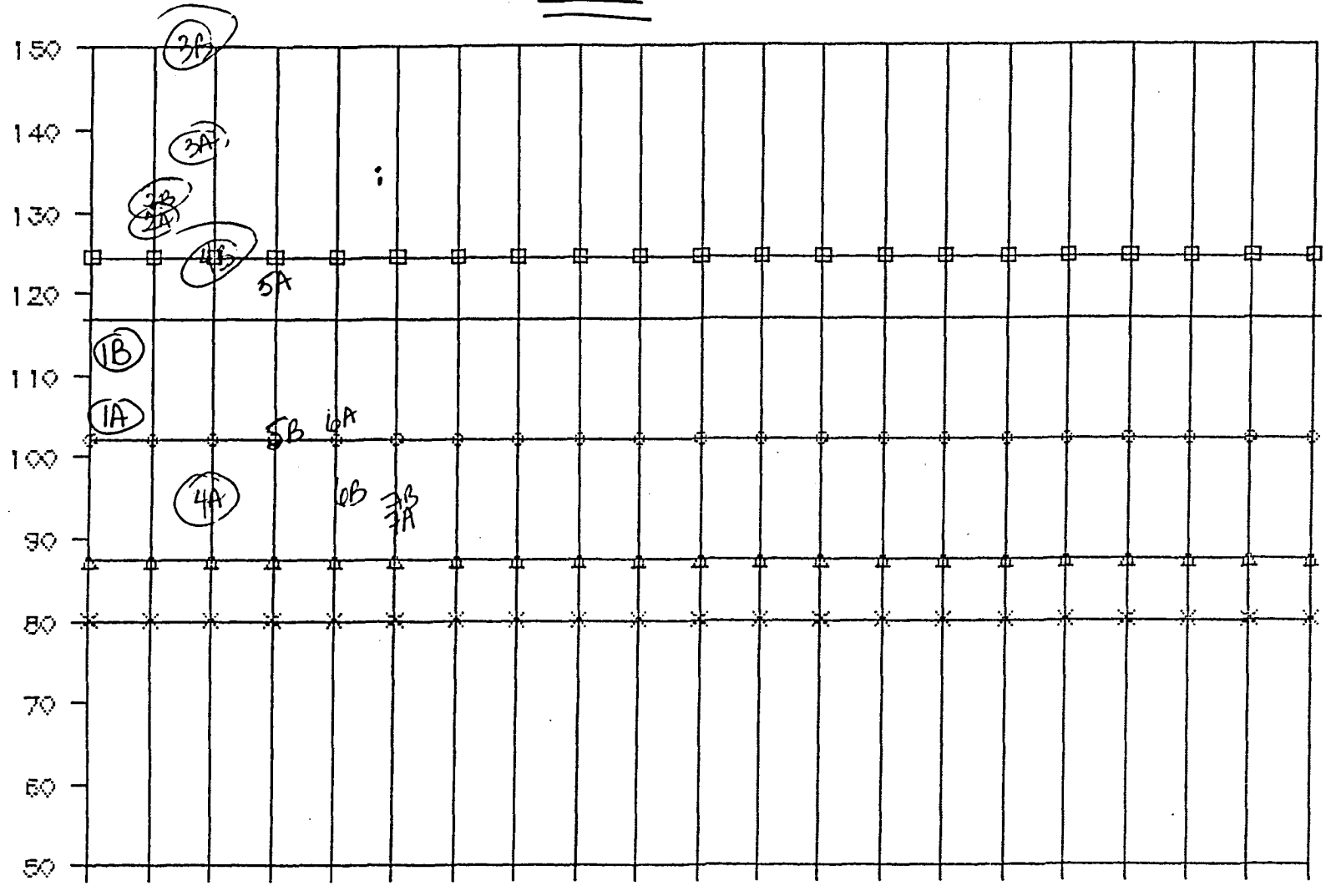
* - Acceptance criteria based upon ITAS-Cerritos' 95% confidence level.

8015 DIESEL SOIL RPD 10/26/88



UPPER RPD CONTROL + UPPER RPD WARNING ◇ MEAN RPD

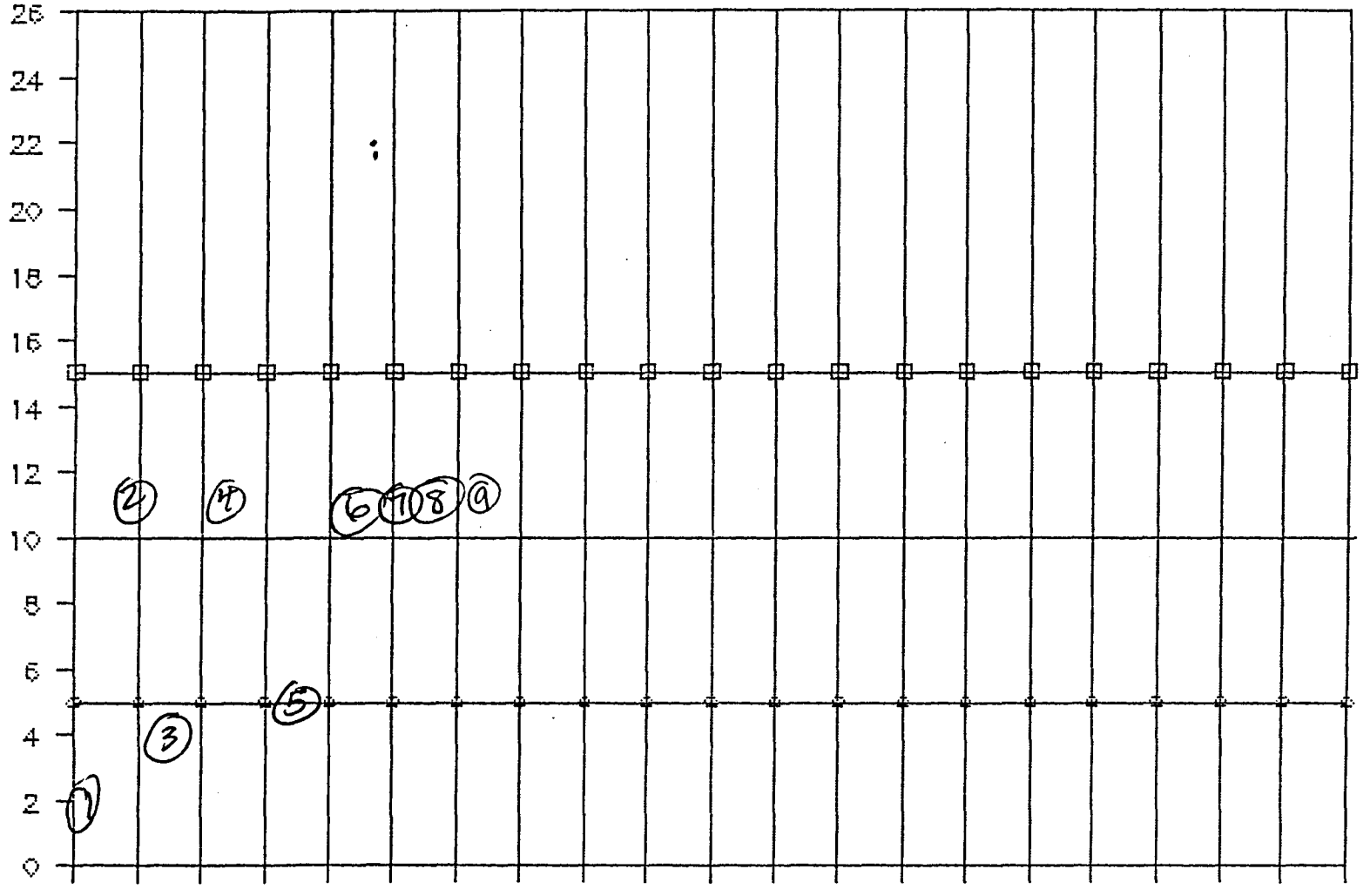
8015 DIESEL SOIL %REC 10/26/88



ER REC WARNING ◇ MEAN REC △ LOWER REC WARNING

8015 MOTOR OIL SOIL RPD

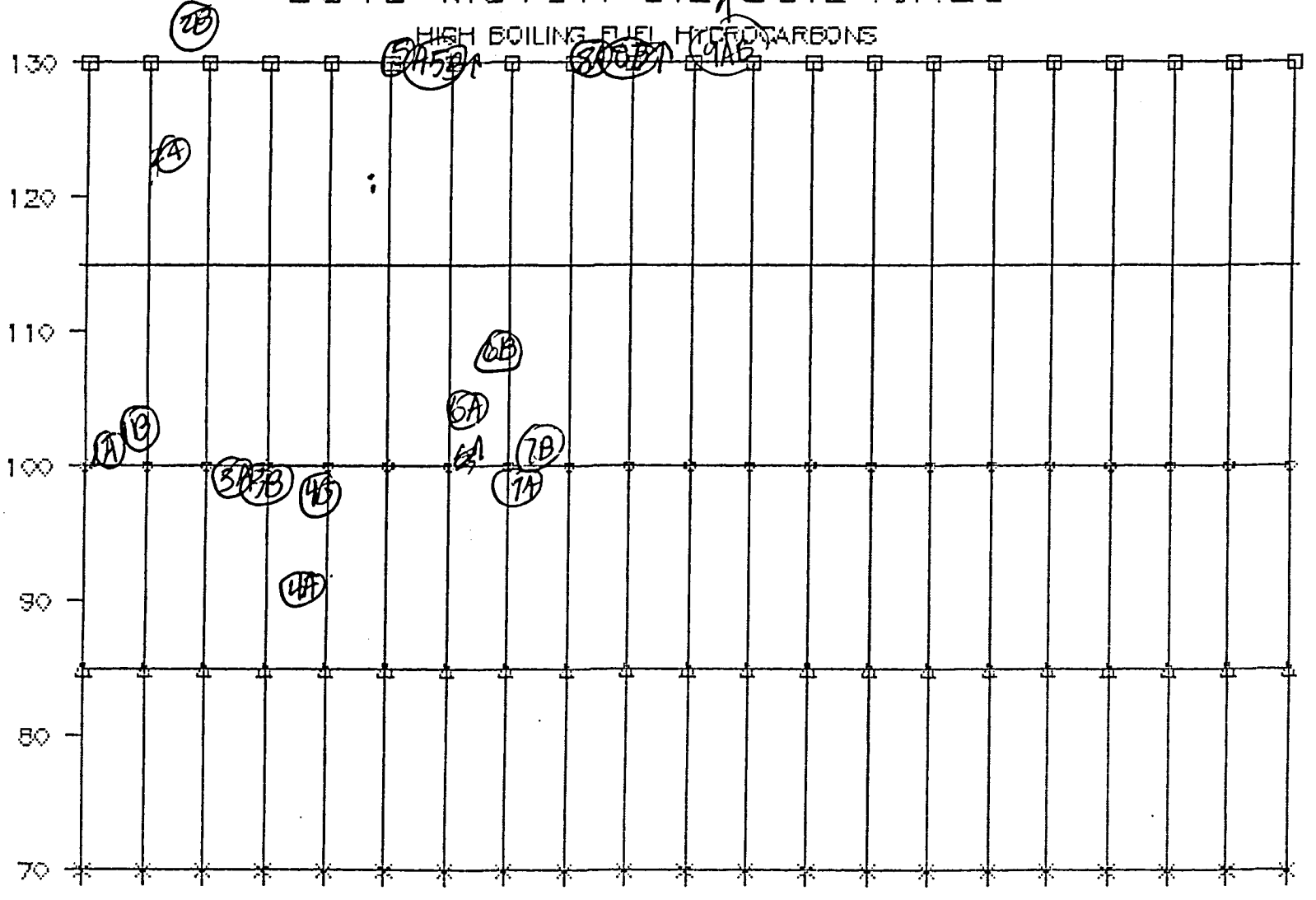
HIGH BOILING FUEL HYDROCARBONS



PPER RPD CONTROL + UPPER RPD WARNING ◇ MEAN RPD

8015 MOTOR OIL SOIL %REC

HIGH BOILING FUEL HYDROCARBONS



ER REC WARNING ◇ MEAN REC △ LOWER REC WARNING

& control chart not based on historical data num 24

IV Summary of Non-Conformances

Hunters Point
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No Non-conformances were submitted for this project.

V Summary of Analytical Variances

Hunters Point
1st Quarter

No Analytical Variances were submitted for this project.

VI Personnel

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Summary of Key Personnnel

Laboratory Manager	- Eric Lindsay
Technical Director	- Ken Faust
Compliance Director	- Dwayne Ishida
Client Services Manager, ITAS HAZWRAP Coordinator	- Cheryl Ferguson
Project Manager, Assistant HAZWRAP Coordinator	- Jennifer L. Roseberry
Project Manager, Hunters Point	- Donna Kozak
GCMS Groupleader	- Ken Faust (Acting)
GC Groupleader	- Patricia M. Chapman
Inorganics Groupleader	- Byron Thomas
General Chemistry Groupleader	- Thomas Robinson

APPENDIX E - OVERSIZED MAP OF HUNTERS POINT ANNEX

TECHNICAL REPORT
UNDERGROUND TANK INVESTIGATION

DATED 7 DECEMBER 1989

N00217.001051
HUNTERS POINT
SSIC NO. 5090.3

APPENDIX E – FIGURE 2-2
OVERSIZED MAP OF HUNTERS POINT ANNEX

TECHNICAL REPORT
UNDERGROUND TANK INVESTIGATION

THE ABOVE IDENTIFIED APPENDIX IS NOT AVAILABLE.

EXTENSIVE RESEARCH WAS PERFORMED BY NAVFAC SOUTHWEST TO LOCATE THIS APPENDIX. THIS PAGE HAS BEEN INSERTED AS A PLACEHOLDER AND WILL BE REPLACED SHOULD THE MISSING ITEM BE LOCATED.

FOR ADDITIONAL INFORMATION,
PLEASE CONTACT:

DIANE C. SILVA, RECORDS MANAGER
NAVAL FACILITIES ENGINEERING COMMAND SOUTHWEST
1220 PACIFIC HIGHWAY
SAN DIEGO, CA 92132

TELEPHONE: (619) 532-3676
E-MAIL: diane.silva@navy.mil